# ILLUMINATING ENGINEERING

AUGUST 1954

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Indoor Footcandles for Maintaining Plants
Floodlighting Applications on Buildings
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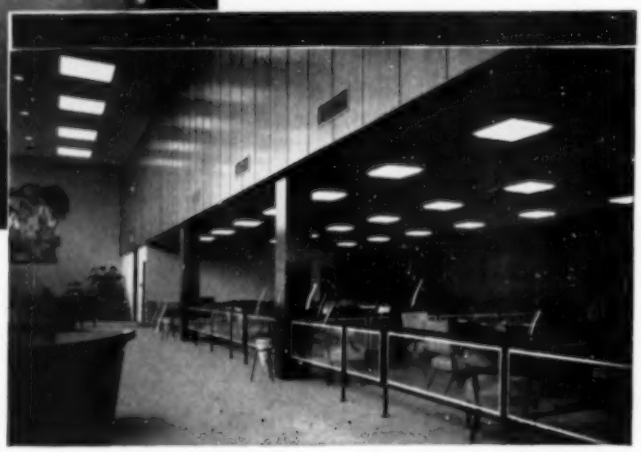

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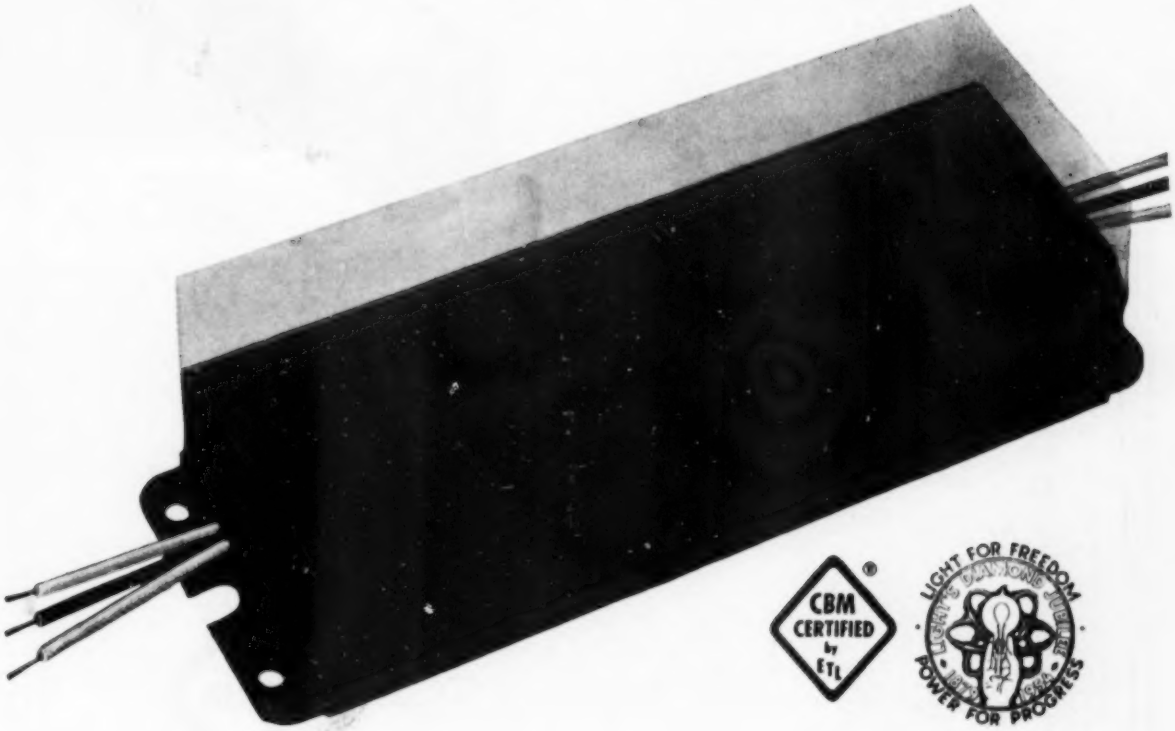


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TESTS OF FLUORESCENT LAMP BALLASTS

PAGE 1 OF 1

MFR. Starring & Co. Inc. PLANT Bridgeport, Conn. DATE SELECTED 5/18/54 BY
CAT. NO. 84a-B77 FOR 2 DATE RECEIVED 5/18/54 ETL ORDER NO. 22463-M
RATING: Watts 40 Volts 277 No. 485 Cycles 60 DATE TESTED 5/19/54-5/26/54 TESTED BY A.T.C. DATA APPROVED MC MFR'S ORDER NO.

| ETL Circuit No. | Circuit | Lamp | Supply Voltage Volts | | Open to Reference Lamp | | | | | | | | | Heating Test | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Minimum Open Circuit Voltage Volts | | Voltage | Rms Current | Power Factor | Peak Current | Ratio Peak to Rms Current | Percent Current 3rd | Ballast Loss at Rated Volts | Overall Power Factor | Heat Burn | Voltage across Starter Terminals Volts | Dielectric Strength Test | Ins. Res. Megs | Time Hrs. | Ambient Temp. C | Coil Resistance Ohms Beg. | | | | Condenser Temp. C |
| | | | At Rated Volts | At Twice Rated Volts | | | | | | | | | | | | | | | | | | |
| Check | Current | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | Specimen No. 5-109-Normal | | | |
| | | 84a | — | — | 185.0 | 0.425 | 46.6 | — | — | — | — | — | | | | | | | | | | |
| | | 84a | — | — | 181.0 | 0.351 | 54.4 | — | — | — | — | — | | | | | | | | | | |
| | | 84a | — | — | 184.0 | 0.395 | 46.2 | — | — | — | — | — | | | | | | | | | | |
| 84a | Cont. | | — | — | 179.0 | 0.478 | 46.6 | — | — | — | — | — | | | | | | | | | | |
| | | | — | — | 165.0 | 0.396 | 50.6 | — | — | — | — | — | | | | | | | | | | |
| | | 84a | — | — | 170.0 | 0.396 | 51.6 | — | — | — | — | — | | | | | | | | | | |
| | | 84a | — | — | 167.0 | 0.471 | 54.0 | — | — | — | — | — | | | | | | | | | | |
| | | 84a | — | — | 164.0 | 0.472 | 44.4 | — | — | — | — | — | | | | | | | | | | |
| 5-98 | Mod | 277 | 193 | 340 | — | 0.403 | 39.6 | 0.494 | 1.48 | 0.554 | — | — | | | | | | | | | | |
| | | | 187 | 310 | — | 0.417 | 40.0 | 0.488 | 1.47 | 0.480 | — | — | OK | | | | | | | | | |
| | | | — | — | — | 0.387 | 37.4 | — | — | — | — | — | | | | | | | | | | |
| 5-99 | Mod | | 193 | 340 | — | 0.461 | 39.8 | 0.704 | 1.64 | 0.553 | 13.5 | 99.8 | OK | | | | | | | | | |
| | | | 188 | 308 | — | 0.390 | 38.6 | 0.618 | 1.61 | 0.644 | — | — | OK | | | | | | | | | |
| 5-100 | Mod | 249 | 194 | — | — | 0.536 | 39.3 | — | — | — | 16.5 | 98.1 | OK | | | | | | | | | |
| | | | 186 | — | — | — | 36.0 | — | — | — | — | — | | | | | | | | | | |
| | | 277 | — | — | — | — | 31.0 | — | — | — | — | — | | | | | | | | | | |
| | | | — | — | — | 0.454 | 39.0 | 0.648 | 1.54 | 0.559 | — | — | OK | | | | | | | | | |
| | | | — | — | — | 0.398 | 39.0 | 0.624 | 1.61 | 0.630 | — | — | OK | | | | | | | | | |
| | | | — | — | — | 0.394 | 39.3 | — | — | — | — | — | | | | | | | | | | |
| | | 346 | — | 340 | — | — | 43.4 | — | — | — | 16.9 | 100.0 | | | | | | | | | | |
| | | | — | 310 | — | — | 43.0 | — | — | — | — | — | | | | | | | | | | |
| 5-101 | Mod | 249 | 193 | — | — | — | 39.0 | — | — | — | — | — | | | | | | | | | | |
| | | | 187 | — | — | — | 38.0 | — | — | — | — | — | | | | | | | | | | |
| | Mod | 277 | — | — | — | — | 31.0 | — | — | — | — | — | | | | | | | | | | |
| | | | — | — | — | 0.452 | 39.8 | 0.748 | 1.64 | 0.590 | — | — | OK | | | | | | | | | |
| | | | — | — | — | 0.398 | 39.0 | 0.660 | 1.50 | 0.660 | — | — | OK | | | | | | | | | |
| | | 346 | — | 340 | — | 0.357 | 39.3 | — | — | — | 18.5 | 100.0 | | | | | | | | | | |
| | | | — | 310 | — | — | 44.4 | — | — | — | — | — | | | | | | | | | | |
| 5-102 | Mod | 249 | 193 | — | — | — | 40.2 | — | — | — | — | — | | | | | | | | | | |
| | | | 188 | — | — | — | 38.8 | — | — | — | — | — | | | | | | | | | | |
| | Mod | 277 | — | — | — | — | 31.0 | — | — | — | — | — | | | | | | | | | | |
| | | | — | — | — | 0.429 | 39.8 | 0.670 | 1.58 | 0.557 | — | — | OK | | | | | | | | | |
| | | | — | — | — | 0.390 | 38.8 | 0.604 | 1.55 | 0.640 | — | — | OK | | | | | | | | | |
| | Mod | 346 | — | 340 | — | 0.346 | 39.3 | — | — | — | 18.9 | 100.0 | | | | | | | | | | |
| | | | — | 310 | — | — | 43.8 | — | — | — | — | — | | | | | | | | | | |
| 5-103 | | 236 | — | — | 186.0 | 0.418 | 46.2 | — | — | — | — | — | | | | | | | | | | |
| | | 236 | — | — | 186.0 | 0.402 | 39.6 | — | — | — | — | — | | | | | | | | | | |

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# The Application of Floodlighting to Buildings

By BENJAMIN SCOTT BENSON, JR.

MOST everyone has seen, at one time or another, a building that was outstandingly floodlighted. Everyone has seen, unhappily, installations that looked congenitally tired, frowzy and unloved. It is in the interest of helping the engineer avoid these last that this article has been written. Photographs appearing in this article are of model floodlights and buildings and are intended to illustrate principles discussed in the text.

There are countless aids available to the engineer in designing a floodlighting installation from the footcandle standpoint. Every manufacturer of floodlighting equipment provides formulae for figuring illumination and gives necessarily broad information regarding floodlight placement and selection. Unfortunately footcandles are not the sum and substance of a good floodlighting job and there are many other hurdles standing between the desire and the realization. This is particularly true in the application of floodlighting to buildings, where conditions favorable to easy solution are the exception rather than the rule.

To those among the readers who have had considerable experience in building-floodlighting it may seem axiomatic that the greatest permissible distance the floodlights can be mounted from the building varies inversely as the number of stories the building is high. Actually this is more true than humorous since the many-story building is generally built in an area of high-value real estate where horizontal space is at a premium.

In floodlighting a building of considerable height from close up (say from a marquee over the sidewalk) the first thing the engineer should do is stop worrying about uniformity of illumination — rarely is this possible to achieve. The most he can hope for is a gradual tapering off in illumination from a high occurring a few feet above the floodlights to a low at the building top. This is far from an unpleasant result and, in fact, has been used in a great many instances.

Far more bothersome than the variation in illumination from top to bottom on these close-up installations is "scalloping," that "over-the-waves" motif, caused by the interception of the floodlight beams by the face of the building. Such a pattern of scallops is shown in Fig. 1 where symmetrical beam floodlights are mounted opposite each grey vertical strip (representing a column of windows) (Fig. 1A). The intersections of the scallop of each floodlight with those of its neighbors occur high on the lighter colored wall sections and are very noticeable. In Fig. 2 the same symmetrical beam floodlights are used as before but in this case each is mounted opposite a wall panel (Fig. 2A) with the peak between each scallop camouflaged by occurring on the darker window panels.

The use of ribbed cover glasses on the floodlights results in a rectangular beam that can be used to advantage for close-up installations. With the ribs oriented at right-angles to the line of floodlights, the scallops of light are flattened across the bottom with an improvement in the lighted appearance as shown in Fig. 3 (floodlights opposite window panels) and Fig. 4 (opposite wall panels). Where the area consists of a series of vertical wall and window panels symmetrical beam floodlights can be used (with care). Where the area consists of a relatively unbroken wall expanse, the ribbed covers should definitely be used.

When planning a floodlighting installation it is always advisable for the engineer to obtain from the building architect or owner a cross section elevation of the surface to be lighted. This may show up possible structural or applied elements jutting out from the building that could cast objectionable shadows and thus detract from an otherwise well lighted appearance. In Fig. 5 is shown a building with an exaggerated cornice for purposes of illustration. This cornice casts a shadow of considerable height when floodlights are mounted close to the building and may result in the building appearing many feet shorter at night, under floodlighting, than it does in the daytime. This same floodlighting installation on the same building, minus the cornice, is shown in Fig. 6 to afford the reader a comparison in the visual appearance. Where large cornices exist it may be necessary to

AUTHOR: Chief Illuminating Engineer, Benjamin Electric Manufacturing Co., Des Plaines, Illinois.

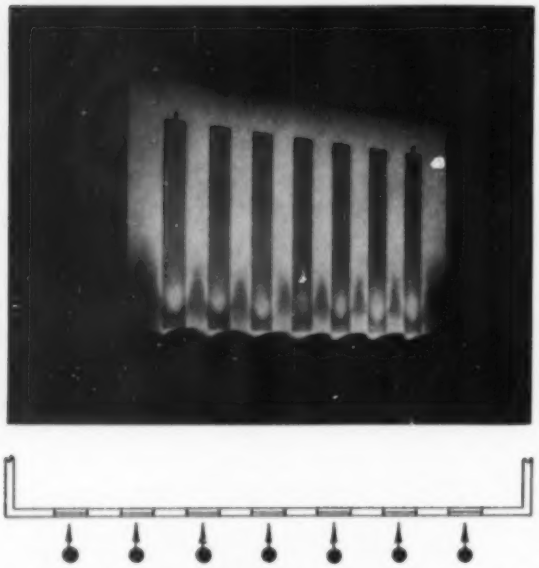


Figure 1 and 1A. Floodlights opposite columns of windows.

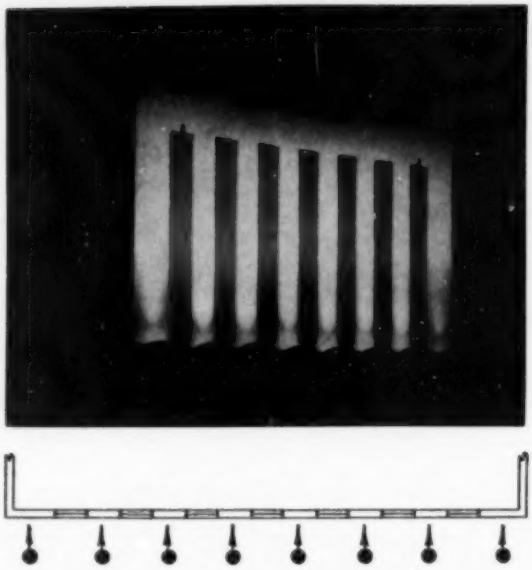


Figure 2 and 2A. Floodlights opposite wall panels.

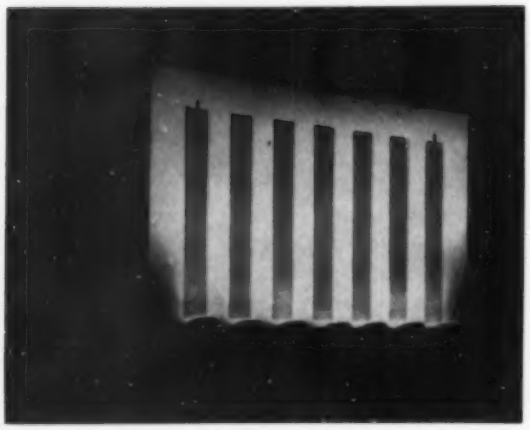


Figure 3. Floodlights with ribbed cover glasses opposite columns of windows.

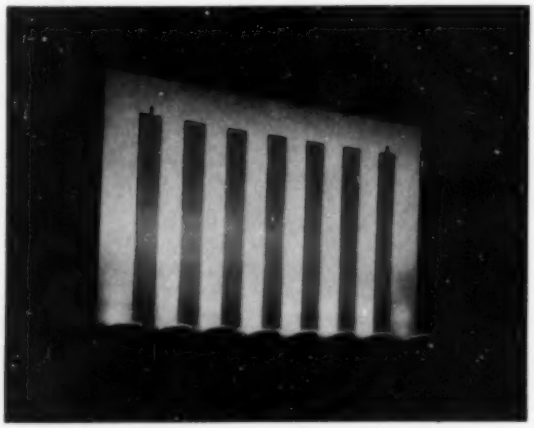


Figure 4. Floodlights with ribbed cover glasses opposite wall panels.

provide auxiliary lighting equipment above them to supply illumination on this otherwise unlighted area.

It is often-times possible to retain the full height appearance of such buildings by moving the floodlights farther back so that the cornice shadow does not extend to the top of the building, as shown in Fig. 7. Here again auxiliary lighting equipment could be mounted on top of the cornice to help wash out the shadow, but, in any event, the building does not loose its height when floodlighted at night.

It is not always possible to eliminate shadows on the face of the building and, indeed, it may not be desirable to do so from the aesthetic point of view. Harmony is always more pleasing than discord, however, and the shadows should blend rather than clash with the architecture. Good results ordinarily can be achieved by causing the shadows to be symmetrical about, or parallel to, some element of the building. For example, the shadow cast by the cornice in Fig. 7, being parallel to the top of the building, is considerably more pleasing than the unbalanced shadow observed in Fig. 8. The result in Fig. 7 was obtained by mounting the floodlights on a line parallel to the face of

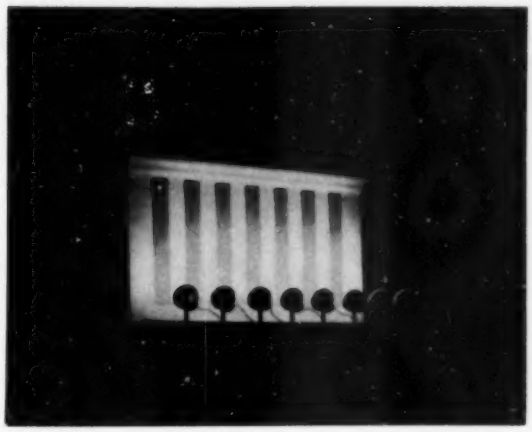


Figure 5. Building with exaggerated cornice, and floodlights mounted close to building.

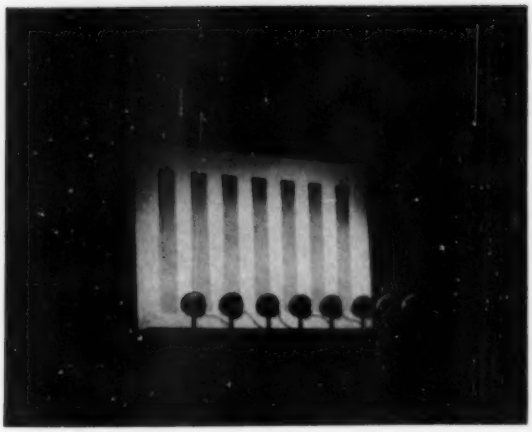


Figure 6. Same building without cornice, and floodlights mounted in same position as in Fig. 5.

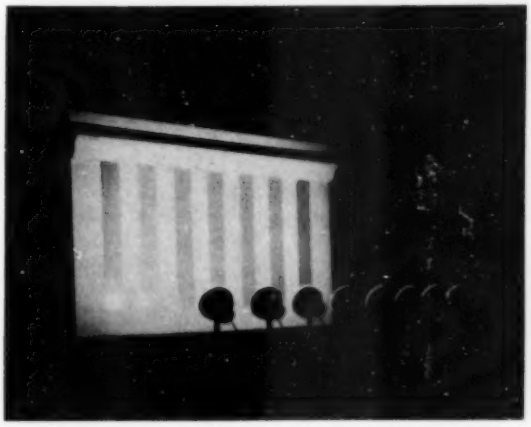


Figure 7 and 7A. Building with cornice, and floodlights mounted farther away from building.

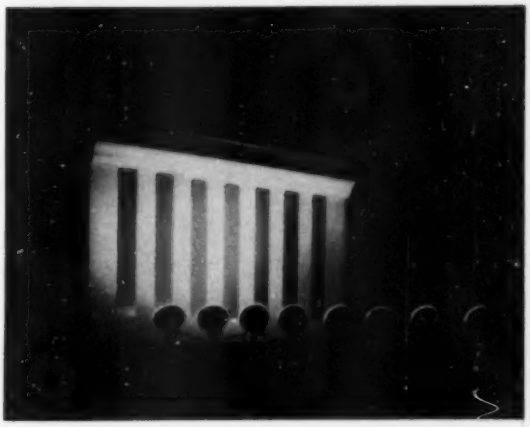


Figure 8 and 8A. Building with cornice, and floodlights mounted at angle to building causing unbalanced shadow.

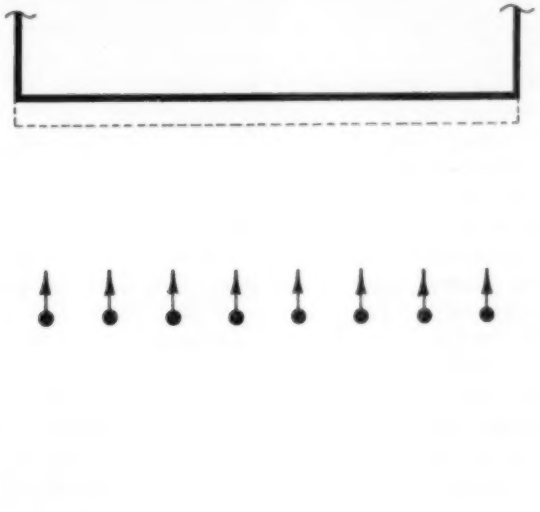


Figure 9. Low building floodlighted with symmetrical beam equipment.

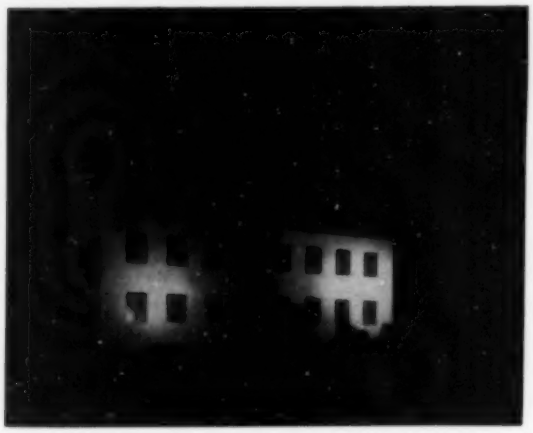


Figure 10. Same low building with two adjacent floodlights inoperative, with resultant dark patch on building.

Figure 11. Same low building with rectangular beam equipment — all lights on.

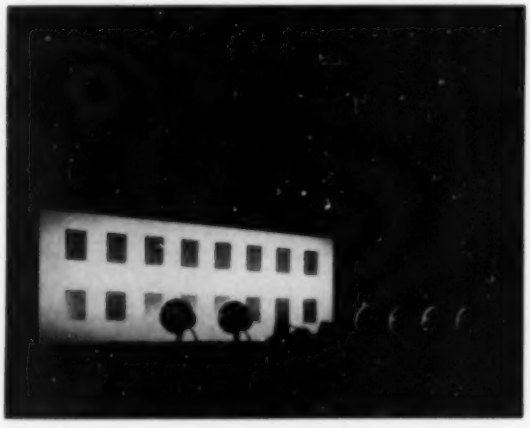


Figure 12. Same building floodlighted with rectangular beam equipment — two adjacent units inoperative.

the building (see Fig. 7A). The shadow unbalance in Fig. 8 occurred when the line of floodlights was placed at an angle to the building face (see Fig. 8A). Keeping the line of floodlights parallel to the wall is occasionally a problem due to angled sidewalks or roadways passing the area to be lighted. The engineer might well sacrifice other less important features of his installations in the interest of keeping the shadows uniform.

When the building to be floodlighted is relatively low, and the floodlights can be mounted some distance away, it is possible to use either symmetrical or rectangular beam distributions to obtain a satisfactory appearing installation. The problem of temporary lamp burnouts causing a lowering of illumination in certain sections should not be overlooked and the engineer will find a minimum reduction in lighted appearance if he uses the rectangular beam equipment wherever possible. Fig. 9 shows a low building floodlighted with symmetrical beam equipment. Fig. 10 shows the same installation with two adjacent floodlights inoperative and a resultant dark patch on the building. Fig. 11 shows the same building floodlighted with rectangular beam equipment (all units on). Fig. 12 shows the same installation with two adjacent units out of operation and the reader can observe the minimizing of the results of temporary burnouts when using rectangular beam equipment.

When two or more adjacent faces of a building are to be illuminated, the engineer may often treat each face as an independent surface and mount his floodlights as shown in Fig. 13. This will permit a uniformly lighted appearance on each face of the building except for a drop-off at the wall ends as

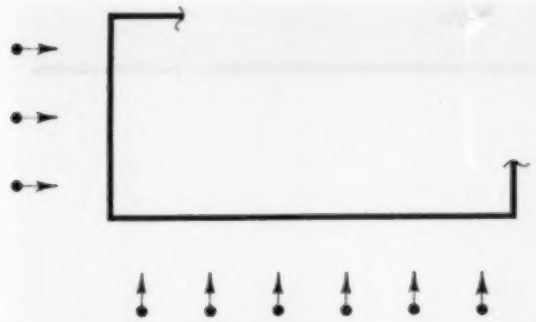


Figure 13. One method of floodlighting two adjacent faces of a building, as independent surfaces.

Figure 14. Drop-off of light at wall ends of building faces when floodlighted as shown in Fig. 13.

Figure 15. End floodlights directed to corner of building with considerable loss of light.

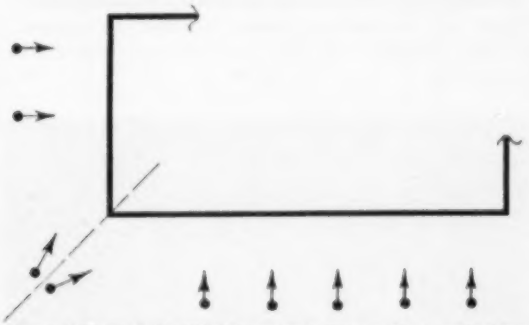
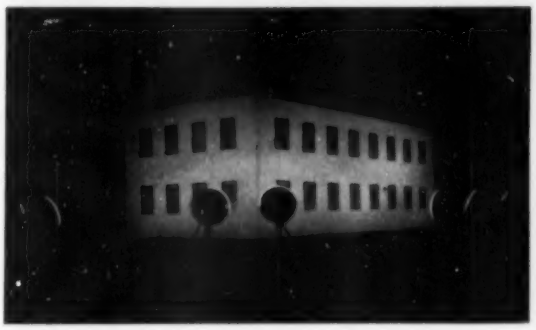


Figure 16. End floodlights mounted on a line projecting equi-angularly out from corner of building.

Figure 17. (below) Uniformity of illumination over corner areas, using floodlighting diagram shown in Fig. 16.



shown in Fig. 14. In order to carry uniformity out to the corner of the building it is necessary to direct the end floodlights so close to the corner that a considerable amount of light is lost, as indicated in Fig. 15. This waste light can be put to work by mounting the end floodlights on a line projecting equi-angularly out from the corner of the building as shown in Fig. 16. With this arrangement a large portion of the light that would otherwise be wasted by each end floodlight, now strikes the adjacent wall and gives good uniformity of illumination over corner areas as seen in Fig. 17.

Occasionally, buildings are provided with porticoes that extend out a considerable distance from the building and cast shadows on the floodlighted walls adjacent to them. Where this occurs the engineer would be well advised to space his floodlights uniformly from the center line of the portico in order to cause his shadows to be uniform. Fig. 18 shows a portico lighted by two floodlights spaced non-symmetrically from the center line with the shadows also non-symmetrical. Fig. 19 shows the uniform shadows resulting from symmetrical spacing of the floodlights.

Closely associated with the floodlighting of buildings is the floodlighting of signs that may occur on the top of the structure. The engineer will usually find these signs to be of highly- or semi-polished stainless steel or aluminum which act, for all practical purposes, like a mirror. Light from below, reaching such a sign, is reflected up into the sky while the night sky is reflected (if you will) down to the eye of the observer. Such an arrangement is wasteful in illumination since considerable quantities of light directed towards the

Figure 18. Non-uniform shadows caused by non-symmetrical mounting of floodlights in front of building with Portico.

Figure 19. Uniform shadows on building with portico, with floodlights spaced uniformly from center line.

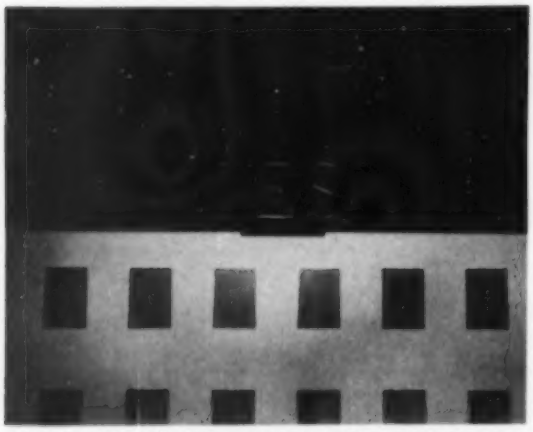


Figure 20. Floodlighting polished stainless steel or aluminum sign with light reflected to sky.

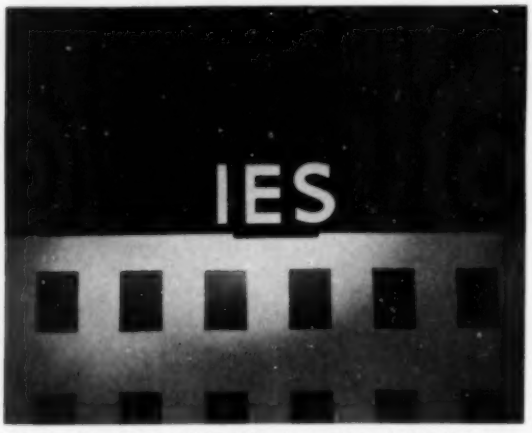



Figure 21. Using light-diffusing white finished letters, sign appears brightly illuminated.

sign still result in a relatively unlighted appearance as shown in Fig. 20. What is needed, of course, is diffusion. When using white finished letters the same amount of illumination as before will cause the sign to appear brightly illuminated as pictured in Fig. 21. Large block letters in light-diffusing finishes that give high background contrast offer maximum seeing conditions when floodlighted.

Quite frequently the engineer is called upon to floodlight a water tank carrying an advertising message. More often than not these tanks are finished in aluminum paint which, characteristically, has a considerable amount of gloss. Floodlighting from below will be reflected from the tank up towards the sky to give, again, a relatively unlighted appearance as shown in Fig. 22. The engineer should recommend the tank to be finished in either a white or light grey paint to insure greater diffusion of reflected light and a much higher viewing brightness. In Fig. 23 is shown a tank finished in a mat light grey having approximately the same reflectance as the aluminum painted tank shown in Fig. 22. A visual comparison of these two photographs, taken under equal amounts of illumination, indicates the advisability of using the more diffuse finish.

When floodlighting a water tank the location of the lighting equipment should be given careful consideration. Quite often the engineer may try to illuminate the tank from only two diametrically located positions. This system cannot be expected to provide uniform illumination on the tank and the portions at 90 degrees to the floodlight locations will be relatively unlighted as shown in Fig. 24. When this dark portion coincides with the advertising message the latter will, of course, be obliterated. Floodlighting from not less than three locations equi-angularly spaced about the tank will

Figure 22. (left) Aluminum tank reflects light to sky.

Figure 23. (right) Painted light grey, tank appears highly illuminated.

Figure 24. (left) Tank floodlighted at 90-degree angle.

Figure 25. (right) Floodlighting from at least three locations produces uniform brightness.

give an appearance of uniform brightness around the cylindrical surface as pictured in Fig. 25 (3 locations — 120 degrees apart).

Every illuminating engineer will, at some time or other, be consulted regarding the floodlighting of a stained glass window. While this may seem a relatively small task it can result in considerable bother if the problem is not fully appreciated. It is of prime importance to determine whether or not the stained glass is diffusing. Some windows have a coating of diffusing material fired to each piece of glass that will spread the light and provide reasonable viewing brightness. More often than not the stained glass does not have diffusion and the light passing through it emerges practically unchanged in direction and nature (other than color). With a window of low light diffusion large amounts of light can be placed on it with a resultant low viewing brightness as illustrated in Fig. 26. To bring up the brightness of the window it is suggested that a diffusing screen be placed between it and the floodlights to give the results shown in Fig. 27 (photographed under the same amount of floodlighting as in Fig. 26). When a customer desires to floodlight the window from the inside for outside viewing, it is often possible to hang sheeting or other white cloth material on sliding hangers so it can be drawn behind the window at night and removed during the day. When the window is to be floodlighted from the exterior (for inside viewing) the sheeting material is impractical but good results can be achieved by constructing a storm window of sanded glass panels placed only a few inches outside the stained glass window.

Figure 26. (left) Low viewing brightness of window with low light diffusion.

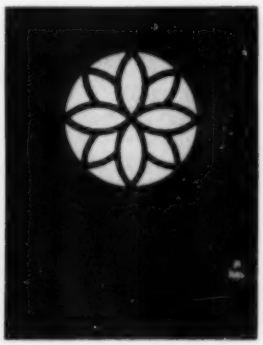


Figure 27. (right) Same window with diffusing screen between window and floodlights.

The engineer will many times receive requests for quite ambitious floodlighting projects that are much beyond the available budget. In working out the necessary compromise he should remember this rule. "Do not attempt to spread the customer's floodlighting dollar too thin." Rather than illuminate a large area to a mediocre level of brightness having little attraction value, the engineer might wisely concentrate the available floodlighting dollars on a smaller portion of the building. One side of a building well lighted, for example, is more impressive than four sides poorly lighted.

As the engineer gains floodlighting experience he will constantly add to his store of ideas that make the next job easier to solve. It is sincerely hoped that the thoughts and illustrations here given will be to his assistance.

# From a Church Steeple To an Excavation Site

## Night Illumination for a Church Steeple

**First in Arizona Chapter**
**Second in Inter-Mountain Region**

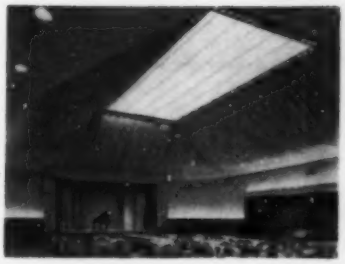
BY DAY and by night the First Congregational Church in Phoenix, Arizona is a beautiful landmark. Snow white, its simple colonial design catches the attention from either direction of its corner location in a quiet residential area.

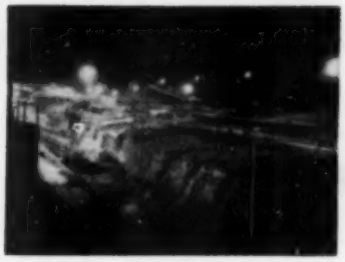
To preserve its beauty at night, floodlighting was designed by J. R. Williams of Arizona Public Service Company, Phoenix. His installation won first prize in the Arizona Chapter's contest for My Most Interesting Lighting Job.

Not all of the conventional floodlighting techniques would apply for the installation. The selection and placement of equipment, for instance, was complicated by the location of the building, close to both streets of the corner, offering little yard space for floodlighting equipment. The steeple, which rises 104 feet from the ground level to the cross at the top, is on the front of the building. In addition to being inaccessible for placing fixtures, and especially for their maintenance after installation, the steeple's location on the church made it impracticable to install equipment on the roof without destroying the architectural lines of the church. Only the yard surrounding the building, limited though this is, was suitable for placement of floodlighting equipment. Placed at ground level, however, new problems were encountered — in breakage hazard, insects, rapid deterioration and pedestrian discomfort. As a solution to this, a system of placing the equipment on an elevated support was devised, high enough to clear pedestrian eye level and yet not detract from the church's beauty.

Two-inch diameter galvanized poles, eight feet high were placed inside the sidewalks, 39 feet from the center line of the steeple. On each pole two PAR-56 narrow beam 15° by 20° 300-watt lamps were positioned (wide axis of beam vertical). These sources were a practical choice for the floodlighting level required for the steeple, especially meeting the considerations of low cost, neat compact appearance and easy installation and maintenance. An illumination level of 5 to 10 footcandles was felt to be sufficient on the steeple since its high reflectance (80 per cent) against the dark, residential tree-studded neighborhood would stand out spectacularly at night.

Maintaining a constant footcandle level from the top of the cross to the point of illumination at the bottom of the steeple was out of the question. For this condition, aiming angle of the lamps would have had to be horizontal or else a large battery of lamps on each post would have to be used, which would have been very unattractive. An even gradient of diminishing illumination from the bottom of the steeple to its top,

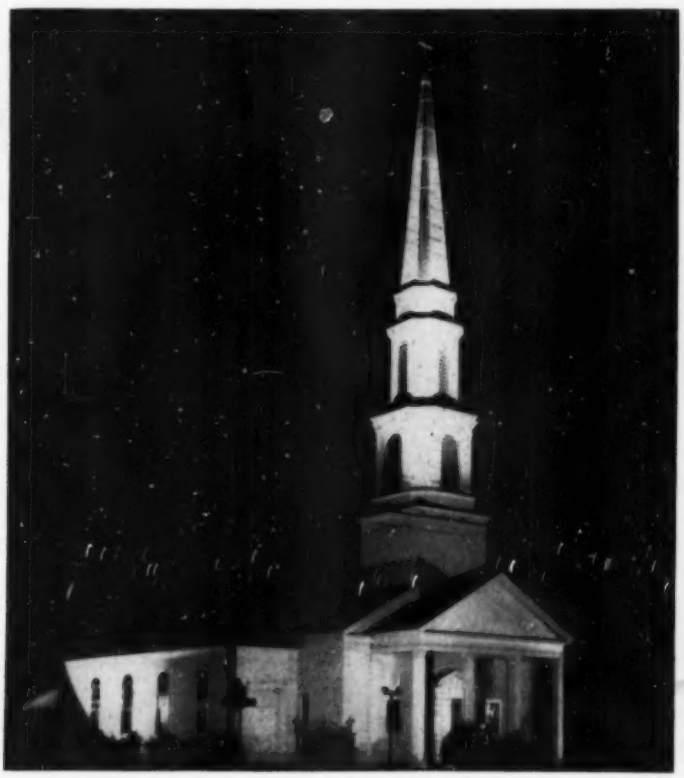




**From a church steeple to excavation-construction site — prize-winning installations reveal engineering techniques for superior results. The diverse selection of installations described in this feature were first prize winners in I.E.S. Section and Chapter contests for My Most Interesting Lighting Job, and placed next to the top against all comers in the Regional competitions.**

however, would be quite effective with the gradual darkening backdrop afforded by the night sky. This was the effect accordingly planned.

For the upper portion of the steeple, which was of a relatively low-reflectance aluminum paneling, overlapping of the beam spread was arranged. The lower portion of the steeple was wood, with a high-reflectance and semi-gloss white paint. Greater light concentration was, of course, required on the aluminum portion. With this arrangement, final product was a steeple visible for many blocks in all directions, due to a gradient illumination level of 10 footcandles at the bottom to 3 footcandles at the cross.



**First — Northern California Section**

**Second — South Pacific Coast Region**

## Harmonious Lighting for a Modern Barber Shop

A FLEXIBLE system for diffused light and a pleasant atmosphere was designed to satisfy several distinct requirements in one large L-shaped room, in the barber shop at the Hotel Mark Hopkins in San Francisco. Illuminating engineer in charge of the integrated multi-purpose lighting was S. J. Hughes, of S. K. Pinney, Inc., contractors. The installation was the entry of the Northern California Section, I.E.S. in the South Pacific Coast Regional contest, where it tied for second place.

This modern shop, with the absence of unnecessary ornament, designed on the modern principle of easy maintenance, called for an equally modern system of lighting. An interview with the people working in the shop added to the problem: the barbers wanted a light suitable to give a first class haircut to a discriminating clientele — high levels over a wide area, so the barber will not be in his own shadow, with a minimum of glare. The manicurist was interested in a soft low-level light, in which the client can forget his surroundings while she holds his hand.

Other considerations adding interest to the project were: a low ceiling height, mirrors on one wall, and two small windows which did not provide enough light to be considered in the overall illumination, but which did create two slits of disturbing glare.

A large photo mural was used on the wall opposite the mirrors, as a partial solution to these three last factors. The mural — a panorama view of San Francisco — detracts glare from the mirrors and adds a feeling of space to the room.

A luminous panel system, of 24 x 24-inch plastic coffers (transmission factor about 55 per cent) was the lighting approach to a uniform appearance with a wide variation in footcandle level. To minimize contrast between the luminous panels and the acoustical tile ceiling, the panels were dropped 1¼ inches below the adjoining ceiling, so they will spill light to the side and blend in with the tile.

Over the barber chairs, a working illumination of 120 footcandles is provided by the 4-foot-wide by 16-foot-long panel, two feet from the mirrored wall, using four rows of fluorescent channel on 9-inch centers with a total of 24 48-inch T12 cool white lamps.

The manicurist was made happy by the 45 footcandles diffused over her area from a similar panel, 4 feet wide by 8 feet long. The "waiting line" area, near the panorama mural, is lighted to a comfortable reading level of 50 footcandles by a 2 x 12-foot coffer system.

Overall average brightness ratios of walls and ceiling to the light source are less than 10 to 1. Some individual readings are: floor, 25 ft-L; walls, 15 ft-L; mirror, 230 ft-L; acoustical tile ceiling, 28 ft-L; luminous panels, 220 ft-L.

The plastic coffers in all panels are removable units resting on metal framework to give easy access to the lamps.

**First — Iowa Section**

**Second — Midwestern Region**

## Lighting Makes a Garden Room

LIGHTING was the key to creating an outdoor garden atmosphere in one of the public rooms of the Hotel Kirkwood, Des Moines. The room, to be known as the Garden Room, is used for business meetings, noon luncheon clubs, ladies bridge clubs, cocktail parties and banquets, with illumination requirements varying from one to ten footcandles. Mrs. Mary Stafford, of Thomas Electric Co., Des Moines, was handed the job of making a garden of the Garden Room — at the same time supplying a functional lighting system.

A summer-sky effect is achieved by mounting 34 metal indirect bowl-type fixtures on top of the beams (which are designed to simulate a garden trellis). The fixtures are 6 feet on centers, 3 feet in from the end and the beams are 6 feet apart. The beams have a slight slope upward to the center of the room, and the lighting units are approximately 3 feet from the off-white acoustical type ceiling.

The four-inch diameter bowls are of aluminum, white enameled on the inside and, on the outside, painted in a light warm beige to match the treated wood finish of the "trellis" beams. Each bowl contains two 60-watt, type A, white incandescent lamps.

On the south wall of the room, which is mirrored in panes, resembling windows, sansaveria and philodendron grow very well in window planters under the light from nine 100-watt recessed incandescent units, on 3-foot centers.

Three architectural wall coves on the east wall are lighted with 14 10-watt lamps each, mounted on 9-inch centers in adjustable sockets behind each valance. On the walls of the coves, "plants" of wrought iron painted in glowing pink, flame and salmon, with verdant green leaves, grow from red tile flower pots to add to the garden motif. The grass-green carpeting, also, heightens the garden atmosphere.

Functionally, two surface-mounted adjustable spots, one at each end of the room, are used for highlighting the speakers table at business meetings.

All lights in the Garden Room are controlled with a variable voltage dimmer, which constitutes one of the most popular features of the room. Patrons are permitted to operate the dimmer control, which is located in an ante-room, making their own choice of illumination for their club luncheon or other activity. The hotel has posted a chart of suggested settings for different activities ranging from daytime business meetings with full setting of 10 footcandles to late afternoon or evening cocktail hours with all lights off except those in the three coves.

**First — Eastern New York Chapter**

**Second — Northeastern Region**

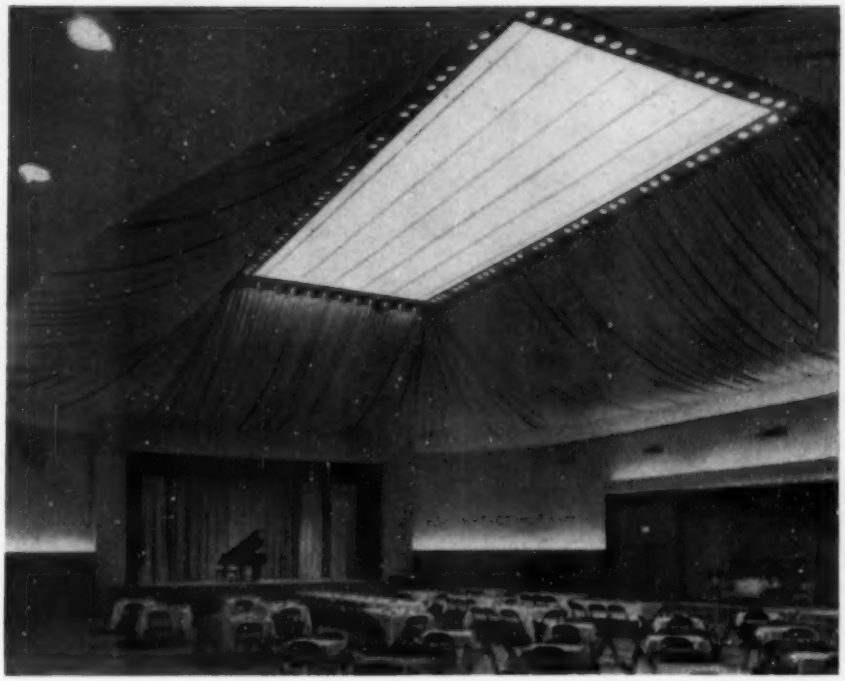
## New Technique with Troffers

THIS photograph of the prize-winning installation at the Niagara Mohawk Power Corporation's office in Johnstown, N. Y., looks like a conventional luminous ceiling, but it is not. A technique has been used, combining luminous paneling with troffers, which results in high levels of illumination with exceptionally comfortable brightness ratios. The job was the work of Coburn D. Hollister, lighting advisor for Niagara Mohawk in Albany, and was entered in the I.E.S. contest for My Most Interesting Lighting Job.

Two-lamp Alzak parabolic louvered fluorescent troffers, into which have been cut relatively large apertures for upward light are suspended from the old metal ceiling. Corrugated vinyl sheet plastic is inserted between the rows of troffers, resting on the flange and kept in place by a metal strip fastened to the troffer about half an inch above the flange. Since the plastic strip is available in a 36-inch width, space between troffer rows was limited to this distance. In making holes in the troffer units, of whatever shape (these were round), care should be taken to make the aperture location behind the lamp so that the light that is allowed to escape upward is that portion of the light which is normally trapped behind the lamp. With the apertures so located, the downward component of the lighting equipment is not materially reduced. This type of unit, with apertures greatly improves the maintenance factor and eliminates additional cost of installing light strips on top of the troffers.

Adjustable accent units were added for highlighting displays and for night lighting when the office is closed.

Brightness ratio between troffers and the plastic ceiling is a comfortable 4 to 1. With the type of unit used with the troffer, end brightness of the units is within comfortable limits, approximately 6 to 1. Contributing to this comfort, in an environment having 150 footcandles at work level, is a color scheme of pastel green-gray on the walls (68 per cent reflectance), green and cream asphalt tile flooring and metal furniture finished in a light gray-green.



All lights on.

First — Cleveland Section

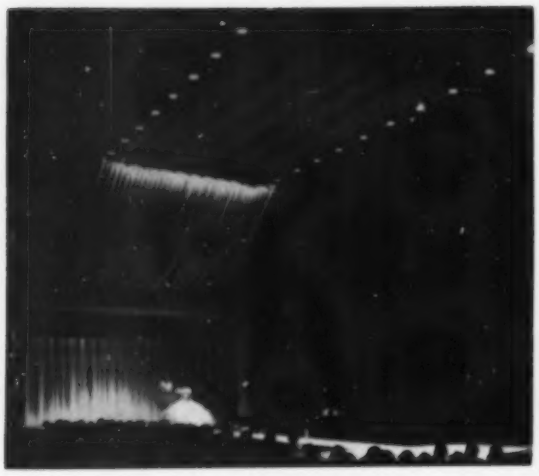
Second — Great Lakes Region

## Flexible Lighting for a Store Auditorium

THE HIGBEE Company (department store) Auditorium in Cleveland, has always been in demand for style shows, luncheons and many civic affairs. Since completion of the lighting installation described here, it is booked solidly for the next two years. The design was awarded first prize in Cleveland Section's contest for M.M.I.L.J. as the entry of R. T. Dorsey, General Electric Co., Nela Park, Cleveland, Ohio. Serious engineering, as well as creative imagination was required; results are the combined planning of Mr. Dorsey, David Pritchard (Nela Park) and Higbee Company engineers under the direction of C. E. Eerkes, in charge of store operations.

Since the auditorium was to be the scene of so many varying functions, a high degree of flexibility as to mood, color and focus of attention was required from the lighting. Main consideration was not "by the book" for auditoriums, but what could be accomplished to meet the requirements of any number of various uses of the area. Consultation with Higbee staff members established

Luminous panel, PAR-56 and R-40 spots on.



PAR-56 and R-40 spots only.

PAR-56 spots only.

the several "attention areas" and atmosphere requirements.

Essentially the auditorium is an oval, with a lobby at one end and a fully equipped stage at the other. The area is windowless, so that regardless of the function, its lighting design is of major importance.

Dominant feature of the relighting plan is a luminous panel of corrugated plastic 20 feet by 60 feet in size. Like one huge "fixture," the panel was assembled near the floor and hoisted into place. For flexibility of mood and color, the panel is equipped with 40-watt rapid start lamps in three colors — pink, gold and blue. These lamps are spaced to give essentially uniform brightness of the plastic in each color and are controlled by the new fluorescent dimmer, which provides control of light output over a range of 100 to 1. Many mixtures of color are possible, from white to each of the individual colors.

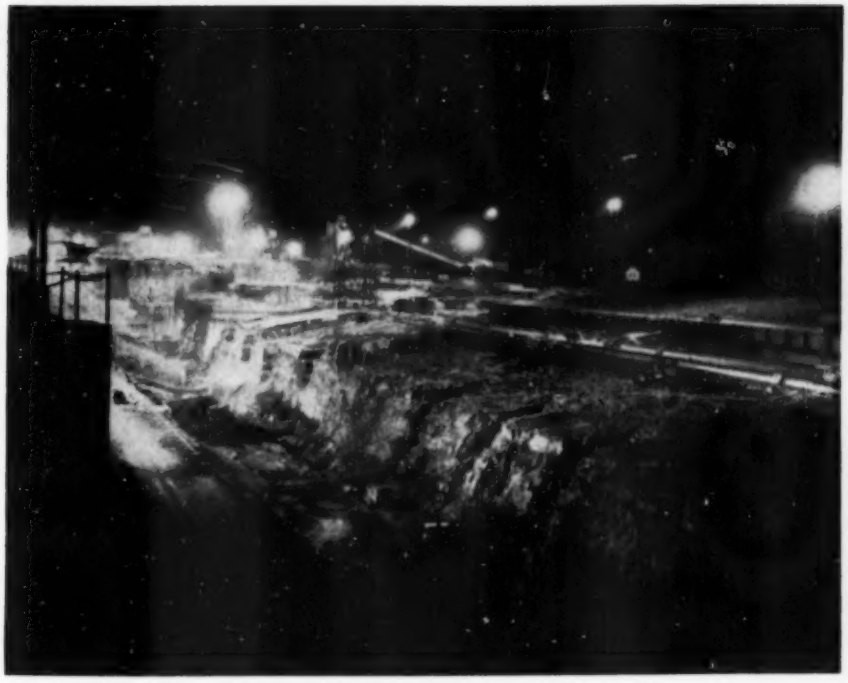
Around the perimeter of the panel are located PAR-56 spotlamps to focus attention on the stage and on the runway used for fashion shows. The lamps are so directed that the illumination is practically constant the length of the runway, with the beam spread arranged to cover slightly more than the width of the runway. Horizontal illumination is about 300 footcandles and vertical illumination is about 80. At the stage end of the panel the lamps are directed to cover the stage apron, eliminating all dark spots on the model steps from the stage to the runway.

In between the PAR-56 spotlamps are reflector color lamps in pink, yellow and blue. These also are aimed at the runway, but their wider spread reaches well out into the audience with a purposeful inclusion of the audience in the mood set by the colored light. Illumination level with the yellow lamps on is about 30 footcandles horizontal. Each of the color circuits is on a dimmer as are the PAR-56 spotlamps. The lower cove near the stage contains incandescent lamps and the upper one above the loges uses 40-watt rapid start fluorescent, also on dimmers, in deluxe warm white which provides a good match for the incandescent.

Part of the charm of this installation lies in the color that was chosen for the walls and for the spectacular Fiberglas drapery which forms the ceiling. This was the subject of much experiment and discussion; the final color is a light gray-green. As one might expect, it appears gray-green only when the lighting is adjusted so that the illumination is essentially white. At other times it changes to fit the mood and lighting of the moment.

Trained technicians have been assigned by the store to operate the control board for the auditorium and stage, with lighting effects planned and specified before each event. Maintenance of the installation has also been provided by the store, with a telescoping scaffold and a maintenance crew.

A most dramatic, and at the same time functional, area has been developed by this installation, meeting quite effectively the store's wish for "a distinctive contribution to civic consciousness."



First — Oregon Section

Second — Pacific Northwest Region

**Continuous excavation and construction operations on a 24-hour day, 7-day week basis are made possible with . . .**

# DUSK TO DAWN FLOODLIGHTING

AROUND the clock operation was imperative to the Dalles Powerhouse Constructors on their contract to complete Phase One of the Dalles Dam Powerhouse, on the Columbia River. The Donovan Construction Co., of St. Paul, Minnesota, the electrical contracting member of the construction firm, was responsible for providing a lighting installation to comply with contract requirements, and permit safe efficient operation in the absence of daylight. The installation provided was the Oregon Section's entry in the Pacific Northwest Regional contest for MMIIJ, with D. E. Seely and K. W. Moore, of Westinghouse Electric Corp., and Westinghouse Electric Supply Co., as contestants, placing second in the Regional competition.

Careful review of the minimum level of illumination required by the U. S. Corps of Engineers, and discussion of anticipated construction techniques, indicated:

- A minimum level of 2 footcandles on the ground would be needed in the active construction area.
- The installation would require a service life of from 5 to 7 years.
- Lights would burn from dark to daybreak seven days a week.
- General nature of the project indicated a dusty atmospheric condition.
- Maintenance would be only fair.

All these conditions then had to be met by an installation which could be quickly and easily installed, and at a reasonable price.

The program to be followed required that the lights on the Washington side of the project be installed first to permit excavation to bed rock.

**Daytime shot of the site taken from the Washington side of the project, showing the Whirley cranes, the coffer dam, the floodlight structures and general terrain. Nighttime view on the preceding page is looking down-stream from atop the coffer dam, showing detail afforded by the adequate illumination.**

Since Whirley type cranes would be used in the construction, it was found that no lighting structure could be installed within 100 feet of the crane tracks.

A general survey of the construction area revealed the major activity would take place between an existing coffer dam on the Oregon side and a dry rock section of terrain on the Washington side. As a general plan it was decided to mount luminaires on wooden structures approximately 350 feet from the centerline of construction on the Washington side and floodlights on similar structures on top of the coffer dam on the Oregon side. The Washington side structures would then clear the crane tracks by 200 feet and the floodlights on the Oregon side could be raised on the coffer dam as construction progressed. Additional luminaires mounted on the cranes would provide extra illumination in the active area of the cranes.

To arrive at a final design the area was divided into three sections: the first section, called the "construction area," was a section 1480 by 280 feet lying between the two crane tracks. The section, called the "work area," included the "construction area" plus a strip 100 feet wide on the outside of the crane tracks. The third section could exist anywhere in the construction area and was designated as the "pour area." This was the area between any two opposite cranes and would be approximately 200 feet long by 100 feet wide.

The general construction contract required an average maintained level of 2 footcandles, but in view of the recommendations of the *I.E.S. Lighting Handbook* for levels of 2 footcandles for excavation and 10 footcandles for construction, the following levels were selected:

"Construction area" — 2 footcandles
"Work area" — 1.5 footcandles
"Pour area" — 8 footcandles.

These values were to be average and maintained in service. Calculations indicated that the best photometric results would be obtained by using I.E.S. class GP luminaires with Type II distribution mounted on 90-foot wooden structures on the Washington side; and class GP luminaires with I.E.S. Type III distribution on similar structures on the Oregon side. Units on the Washington side of the construction area are equipped with impact resisting cover glass. Units mounted directly on the Whirley cranes would be I.E.S. class GP with Type III distribution. All units use 1500-watt PS-52 general service lamps burned at rated voltage.

Design calculations were completed and the installation was energized in September of 1953. Photometric measurements taken early in 1954 produced the following results:

"Construction area" — 2.5 footcandles, average.
"Work area" — 1.7 footcandles, average.
"Pour area" — 5.5 footcandles, average (one crane only)

The results satisfied the contractural requirements and slightly exceeded the design values. As a result of the installation, the safe and efficient construction of the Dalles Dam Powerhouse proceeds continuously.


**I.E.S. Emblem**

The official emblem of the Illuminating Engineering Society is available to members in 14-karat gold, lapel screw back buttons, in the miniature ½-inch size, at only $3.50 each including taxes. Background of emblem is blue for Members, red for Associate Members. Emblems may be ordered from the General Office, Illuminating Engineering Society, 1860 Broadway, New York 23, N. Y.

# Indoor Footcandles for Maintaining Plants

By ROBERT L. ZAHOUR

OVER the years, vast improvements in the design, operation, and efficiency of heating systems have led to more uniform indoor temperatures, and furnace fumes no longer prevail. This advancement in heating has provided temperature ranges favorable to indoor plant growth.

Likewise, efficient light sources and modern equipment now provide higher levels of illumination indoors, and ornamental plant arrangements are no longer limited to window areas.

Horticulturists can now offer to the decorator many new kinds of ornamental plants for beautifying modern homes, hotel lobbies and dining rooms, restaurants, office foyers, reception rooms, department stores, and display areas. Modern lighting levels and uniform indoor temperatures favorable to the growth of these new varieties, make it possible to decorate interiors with artistic plant displays, even when little or no daylight is available. When a foliage plant is purchased for a particular decorative purpose, a slow rate of growth is most desirable to keep its attractive appearance.

Many of the foliage plants can be "trained" to maintain their attractive appearance while making this slow rate of growth. This "training" or adaptation process involves keeping the soil moderately dry by double potting in jardinieres, troughs or other desirable containers. A porous clay pot containing the established plant is placed within a larger pot, jardiniere, or trough large enough to allow approximately a one-inch space between the sides. When this space is filled with garden peat moss or moist sphagnum moss, the soil around the roots dries slowly over a period of several days. When water is required, it is applied to the soil in the pot the first time, and the next time to the peat or sphagnum. This method of dry culture will "train" plants to continue their growth at a slow rate. In the beginning, however, it may be necessary to water more frequently until the plant has become "trained."

AUTHOR: Westinghouse Lamp Division, Bloomfield, N. J.

### Rutgers Experiments

To determine minimum footcandle levels conducive to slow, healthy, and attractive growth of plants indoors, studies at Rutgers University, in cooperation with the Westinghouse Lamp Division and New York Florists' Club, were started a few years ago toward the culture of foliage plants under electric lights. The project was conducted under the direction of Dr. O. Wesley Davidson, Research Specialist in Ornamental Horticulture, Fig. 1.

In the preliminary stages of the work, duplicate groups of ornamental plants were grown under various light sources to determine which types were favorable to plant growth. Standard 3500°K white fluorescent lamps or a mixture of standard cool white with incandescent lamps produced good results. Incandescent reflector spots such as the PAR-38, R-30 or R-40 types positioned high enough above the plants to prevent excessive foliage temperatures and to provide moderate levels of light, were found to be exceptionally desirable, for they also accent the décor of plants.

From results of continued study under the white fluorescent lamps and incandescent spots, Dr. Davidson established the following relationships between light intensities and maintenance of attractive plant growth:*

> The minimum light intensity recommended for any given plant was chosen arbitrarily as the least amount of light necessary to permit the plant to grow and to remain attractive for at least 12 months when illuminated for 16 hours daily. The brighter the light the shorter will be the minimum period of illumination. Moreover, the greater the intensity and the longer the period of daily illumination the wider will be the assortment of plants permissible. In other words, if the light intensity is increased from 20 to 50 footcandles for 18 hours daily, the plants will remain attractive for a longer period.

The amount of artificial light available to foli-

*"Footcandles and Green Leaves," by Dr. O. Wesley Davidson, March 1954, Circular 558 New Jersey Agricultural Experiment Station, Rutgers University, New Brunswick, New Jersey.

**Figure 1. One section of underground "greenhouse" at Rutgers University, where studies on ornamental plants under electric lights are in progress.**

**Figure 2. Trough of artistically arranged ornamental plants placed in a wall recess, accent lighted from above by one 40-watt white fluorescent lamp and two 75-watt R30 spotlights concealed by valance.**

**Foliage Plants Grouped According to Intensity of Artificial Light Needed to Maintain Them for at Least 12 Months***

| A<br>Low-Light Requirement<br>(15-25 footcandles) | B<br>Medium-Light Requirement<br>(25-50 footcandles) | C<br>High-Light Requirement<br>(50-100 footcandles) |
|---|---|---|
| Aglaonema commutatum | All Plants Listed under *A* Do Better in this Light Range | All Plants Listed under *A* and *B* Do Better in this Light Range |
| " pictum | | |
| Araucaria excelsa | Aglaonema marantifolium | Fatshedra lizei |
| Aspidistra lurida | " roebelini | Ficus doescheri |
| Aucuba japonica | Anthurium hybrids | " exotica |
| Dieffenbachia amoena | Begonia metallica | " pandurata |
| " picta | Bromeliads—various | Hedra helix var. Eali |
| Dracaena deremensis | Chlorophytum species | " " " Maple Queen |
| " rothiana | Cyrtomium rockfordianum | Pothos (Scidapsus) |
| " sanderiana | Dieffenbachia Rochs var. | Spathiphyllum kochii |
| Philodendron cordatum (oxycardium) | Kentia fosteriana | Tolmiea meuziesi |
| Philodendron hastatum | Nephrolepsis bostoniensis | Vitis (cissus) rhombifolia |
| " panduriforme | Peperomia obtusifolia | |
| " pertusum | " " vari. | |
| Sansevieria species | " sandersi | |
| Schefflera actinophylla | Pilea cadieri | |
| Syngonium podophyllum | Philodendron dubium | |
| | " sodiroi | |
| | Pothos (scindapsus) Aureus | |

*Based on daily illumination of 16 hours.

age plants is approximately the mathematical product of the light intensity multiplied by its daily duration. Therefore, 10 hours of light at 30 footcandles intensity will maintain some plants approximately as well as 20 footcandles for 15 hours daily. With some plants there may be an advantage in lighting for as long as 20 hours each day. Bright light for a daily period longer than this may be harmful to some species.

### Minimum Footcandles to Maintain Plant Growth

From results obtained so far, the preceding table groups popular species of foliage plants according to their minimum requirements of electric light as determined by the experiments.

All of the plants listed do well when grown at temperatures of approximately 70° to 75°F in the daytime, and 60° to 65° at night.

Saintpaulias or African Violets not listed in the table, require much higher footcandles than ranges shown. Experiments show that the Saintpaulias does well under intensities from 400 to 600 footcandles.

### Applications

In many commercial interiors where good lighting practice prevails, the footcandle levels are usually high enough to induce slow, healthy, and attractive growth of foliage plants. Office areas, for example, that are lighted with 30 to 50 footcandles; libraries, 30; and hotel lobbies, 20; or in stores where traffic areas average 20 footcandles, merchandising areas, 50; displays, 100-200; and show windows, 200-500; all are suitable locations for slow, healthy plant growth.

**Figure 3. Ornamental plant receives benefit from table lamp while in use for reading or watching television.**

Window boxes filled with an artistic arrangement of ornamental plants are often used as space dividers in hotel lobbies, in the home, or in a restaurant area. Plant boxes may also be set in niches or wall recesses, Fig. 2, for decorative effects. Reflector lamp downlights recessed in the ceiling or in suspended bullet-shaped fixtures installed over the box of plants, will provide not only the required footcandle level conducive to plant growth but will also enhance the ornamental décor of the foliage.

**Figure 4. (left) Decorative table planter lamp with bowl for potted ornamental ivy.**

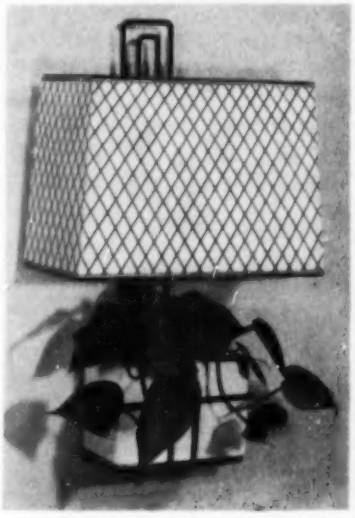


**Figure 5. (right) Pin-to-wall planter lamp with container to display decorative ivy.**

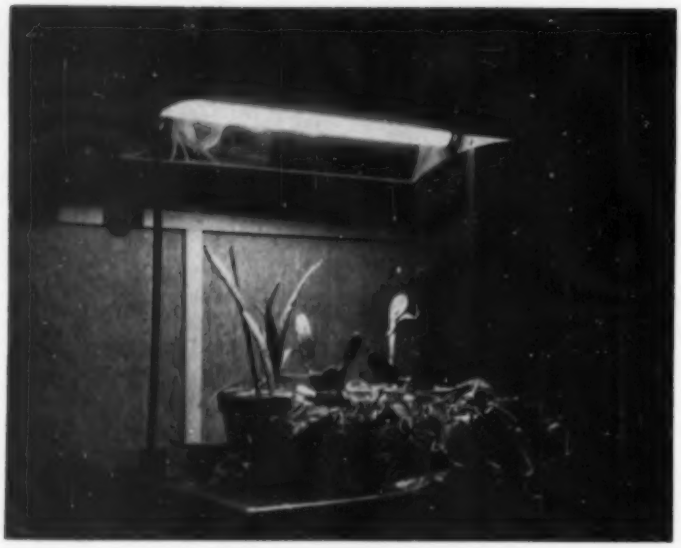


**Figure 6. In a convenient basement corner, an adjustable fluorescent fixture with two 20-watt white fluorescent lamps, attached to bridge table provides facility for starting seeds or cuttings, or rejuvenating plants starved for adequate illumination.**

In the florist shop, a uniform level of 75 to 100 footcandles from a lighting system equipped with cool de luxe white lamps will not only provide plant sustaining illumination, but the de luxe quality of light will also enhance the beauty of flowering species. As a supplement to this system, reflector spot downlights installed over group displays of ornamental plants will accent the décor of the foliage, and make them more attractive to customers.

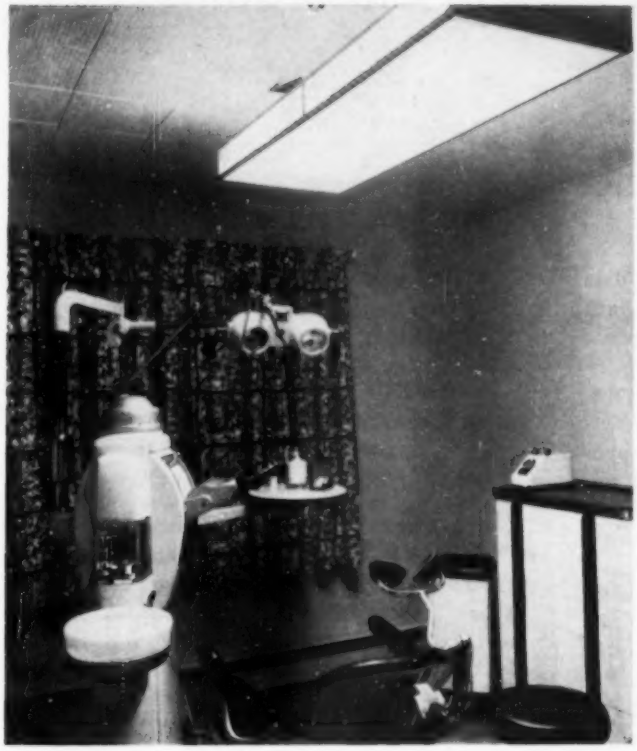
In the modern home where ornamental plants are becoming more and more popular for room decoration, certified reading lamps provide sufficient illumination after dark to supplement daylight levels which at times may not be entirely adequate. A potted plant, for example, placed on an end table near a reading lamp, Fig. 3, with a 100-watt bulb, will receive approximately 75 footcandles at the foliage level while the lamp is in use. However, a table reading lamp equipped with 50-100-150-watt bulb, will provide three levels of light on the foliage. When the switch is turned to the low position, the plant will receive approximately 30 footcandles; at the medium position, 75 footcandles; and at the high position, 100 footcandles. These levels will vary somewhat depending on the height of the plant. When the lamp is switched to the low level for television viewing or as a night light for late arrivals, the plant will receive benefit of this illumination.

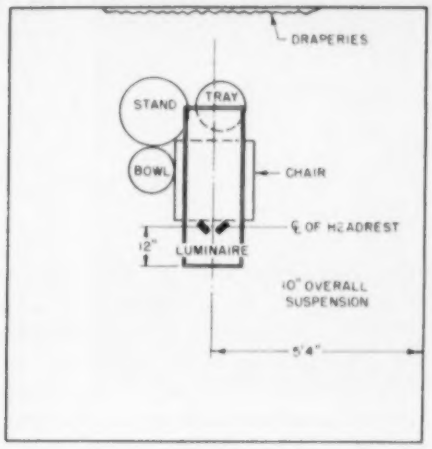
Planter lamps, Figs. 4 and 5, both in table and pin-to-wall types, are made with a container near the base where decorative ivy species may be planted for decoration.

Some hobbyists delight in raising plants from seeds or cuttings. Fif. 6 ilustrates an ararngement where a fluorescent fixture equipped with two 20-watt standard white fluorescent lamps and supported by metal strips is fastened to the sides of a sturdy bridge table. Holes drilled two inches apart on the metal supports provide a means of adjusting the suspension height of the reflector from 5 to 20 inches above the foliage. This flexible arrangement will provide from 100 to 600 footcandles on the plants. House plants which acquire a stickly appearance due to the lack of daily footcandles, may be placed under this portable lighting arrangement for rejuvenation.

**I.E.S. National Technical Conference**

**September 13-17, 1954 — Chalfonte-Haddon Hall Hotel — Atlantic City, New Jersey**






Plan view showing location of luminaire.

**INSTALLATION IN OFFICE OF DR. DONALD E. ZIMMERMAN 817 ENGLEWOOD AVENUE KENMORE, NEW YORK.**

# Lighting a Dental Office

**LIGHTING OBJECTIVE:** To provide a high level of general illumination in a dental office.

**GENERAL INFORMATION:** The dental office shown above measures 10½ x 11 feet with a 7½-foot ceiling. Colors and reflectances are: ceiling — white, 80% RF; walls — green, 50% RF; floor — tan, 15% RF; draperies — green, 40% RF.

**INSTALLATION:** A Wiley No. 40-L 48-inch luminaire with six standard warm white fluorescent lamps and 45-degree end shielding located as shown in the drawing provides the following levels of illumination and brightnesses:

| | | | |
|---|---|---|---|
| Patient's mouth | 200 ft-c | Luminaire as viewed by patient | 2000 ft-L |
| Instruments on stand | 150 ft-c | Ceiling above luminaire | 12 ft-L |
| Tray | 100 ft-c | Ceiling near wall | 9 ft-L |
| Table top | 60 ft-c | Upper side wall over draperies | 7 ft-L |
| | | Side wall beside draperies | 13 ft-L |
| | | Draperies (average) | 10 ft-L |
| | | Dental stand and tray | 10 ft-L |
| | | Dentist's line of sight | 22 ft-L |

With the dental spotlight in use the patient's mouth is lighted to 450 footcandles.

**Lighting designed by Niagara Mohawk Power Corporation, Buffalo, New York.**

**Lighting data submitted by Byron F. Lyth, Jr., Niagara Mohawk Power Corporation, Buffalo, New York, as an illustration of good lighting practice and to aid in the design of similar installations.**

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# Daytime Lighting of School Classrooms

By R. A. BOYD
T. D. WAKEFIELD

PREVIOUS papers[1, 2, 3] have presented data relating to the daylighting of school classrooms through the use of light-directing and light-selecting fenestration materials. In the research work for these papers it was recognized that the lighting of school classrooms for daytime use involved the use of electric lighting as a supplement to the daylighting during times of adverse exterior illumination conditions. Everyone will recognize that the extent to which this supplement is needed depends to a large extent upon the exterior illumination conditions and the fenestration system employed.

For a fixed fenestration system the interior illumination will vary more or less in proportion to the exterior illumination. On some of the darker days the electric lights may be required occasionally. Operating these lights need not be the responsibility of the teacher since some form of automatic control may be used.

AUTHORS: University of Michigan, Daylighting Laboratory, Ann Arbor, Michigan and F. W. Wakefield Brass Co., Vermilion, Ohio, respectively.

**The purpose of this paper is to describe a classroom, constructed at the University of Michigan for research purposes, in which electric lighting and daylighting have been coordinated through the use of an automatic control and to present some of the data pertaining to such an arrangement.**

For research purposes a classroom was constructed at the University of Michigan, in which electric lighting and daylighting were coordinated through the use of an automatic control.

### Experimental Arrangements

Fig. 1 is a photograph of the room in which tests were conducted. It is 29 feet square with a ceiling height of 10 feet 6 inches. The daylighting arrangement is bilateral, in that it consists of four 4 ft by 4 ft toplight panels and a main fenestration composed of five courses of 12 inch light-directing glass block above a vision strip glazed with glare-reducing filter glass.

Figure 1. Room in which tests were conducted.

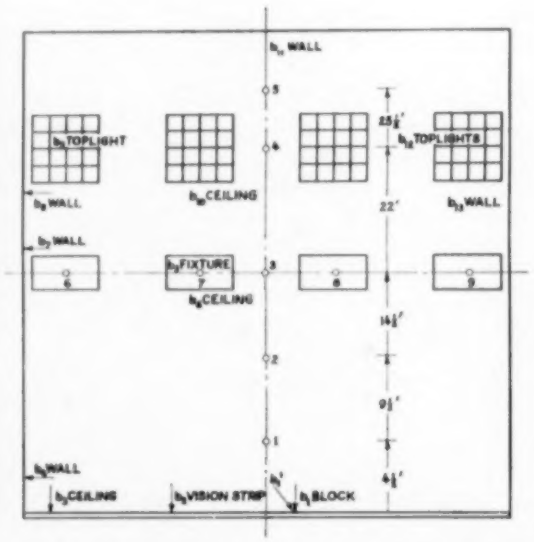



Figure 2. Location of luminaires relative to fenestration.

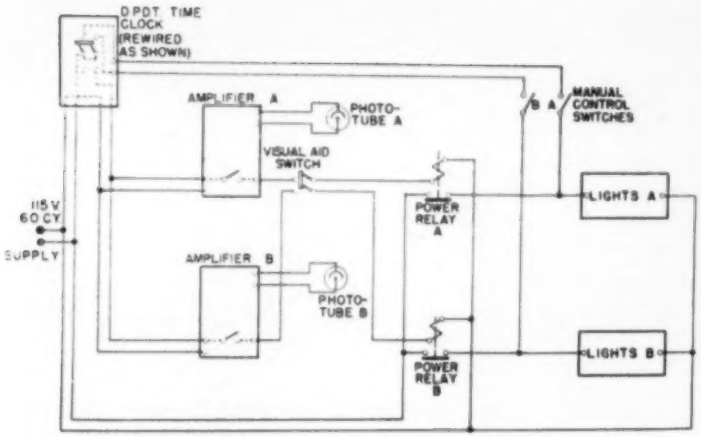



Figure 3. Automatic control for electric lights.

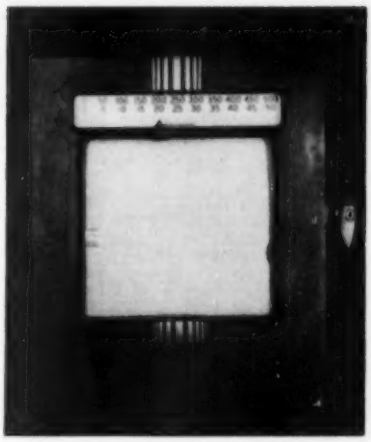


Figure 4. High-speed recorder.

The electric lighting arrangement consists of four rectangular recessed units two feet wide and four feet long. Four 40-watt rapid-start cool white T12 fluorescent lamps are used in each luminaire. Photocell controls switch either two or all four of the lamps. Fig. 2. shows the locations of these luminaires relative to the components of the fenestration.

The automatic control for the electric lights is diagramed in Fig. 3. This control unit was designed by R. E. Knight of the Daylighting Laboratory and incorporates several features that are not inherent in most of the commercially available units. These differences will be described later.

Figure 2, in addition to showing the locations of the toplights and the electric-lighting fixtures, shows the positions at which illumination and brightness were measured. Photocells located at Stations 1 through 9 were connected to a high-speed recorder (Fig. 4) as well as photocells of the outdoor cluster (Fig. 5) and a separate photocell located just outside the main fenestration. These photocells recording the exterior and interior illumination were operated over extended periods of time, whereas, the designated brightnesses were recorded only over a few short periods of time.

The cluster of photocells (Fig. 5) is normally located on the roof of the Laboratory and, since the photocells are shielded from ground reflected light, they measure the direct light from the sun and sky incident upon north, south, east, and west vertical surfaces and a horizontal surface. Such a survey of exterior illumination conditions has been conducted by the Daylighting Laboratory for about three years; some of these data will be cited in this paper.

## Performance Data and Discussion

Illumination and brightness data will be presented for conditions when daylighting is adequate and no electric lighting supplement is needed as well as for conditions when the electric lights are on.

It has generally been assumed that interior daylighting is a minimum on dark overcast days. This is the situation for a bilaterally lighted room but when a room is unilaterally daylighted with other than south exposure then minimum interior daylighting is frequently obtained when the sky is clear and the sun is not shining on the fenestration.

Table I lists a few selected exterior illumination

Figure 5. Photocells of outdoor cluster.

**TABLE I.—Exterior Illumination Conditions.**

| Case | Date | Time | Type of Day | V. S. I. N | V. S. I. S | V. S. I. E | V. S. I. W | H. S. I. Ft-C |
|---|---|---|---|---|---|---|---|---|
| 1 | 3/26/54 | 10:37 | Overcast | 1310 | 1770 | 1660 | 1410 | 3400 |
| 2 | 3/26/54 | 12:38 | Overcast | 790 | 1090 | 980 | 890 | 2140 |
| 3 | 3/26/54 | 1:07 | Overcast | 770 | 760 | 630 | 770 | 1940 |
| 4 | 3/26/54 | 3:01 | Overcast | 440 | 450 | 390 | 450 | 870 |
| 5 | 4/ 2/54 | 11:18 | Clear | 800 | 6400 | 4000 | 870 | 7400 |
| 6 | 4/12/54 | 8:36 | Clear | 620 | 2660 | 8470 | 550 | 4360 |
| 7 | 4/12/54 | 11:00 | Partly Cloudy | 1380 | 2500 | 2280 | 1300 | 4400 |
| 8 | 4/13/54 | 3:00 | Clear | 670 | 2700 | 600 | 7390 | 7050 |
| 9 | 5/ 4/54 | 9:50 | Overcast | 1120 | 1050 | 1070 | 1050 | 2360 |
| 10 | 5/ 4/54 | 9:54 | Overcast | 940 | 1090 | 1060 | 935 | 2200 |
| 11 | 5/ 5/54 | 2:30 | Partly Cloudy | 1730 | 1120 | 765 | 1490 | 3380 |
| 12 | 5/ 5/54 | 2:45 | Partly Cloudy | 1250 | 1000 | 690 | 1230 | 2360 |

conditions for which interior illumination conditions are given by Table II. Table III gives brightness conditions for Case 5, 11 and 12.

Cases 1, 2, 3 and 4 refer to four different times on March 26, 1954. As can be observed from Table I, the day started as a light overcast with an exterior V.S.I. of about 1800 footcandles, at 1:07 p.m. when the V.S.I. had dropped to about 760 footcandles the first two tubes in each fixture were turned on and at 3:01 p.m. when the exterior V.S.I. reached about 450 footcandles the remaining two tubes in each fixture were lighted.

Cases 5, 6 and 8 represent clear days when the vertical surfaces not receiving direct sunlight were receiving 870 or less footcandles of illumination. Table II shows that for these conditions the interior daylighting is more than adequate. This is not surprising in this case since the main fenestration faces south; yet, with this bilateral arrangement the daylighting would be adequate in the morning even if the main fenestration faced west. Case 7, shows similar data for a partly cloudy exterior condition.

Cases 9 and 10 are presented to show that the entire electric lighting supplement is turned off when the interior illumination reaches a preselected value. Prior to 9:50 a.m. (Case 9) the exterior conditions had required both portions of the lights to be turned on. At 9:50 a.m. the illumination at station 3, had reached approximately 80 footcandles and since this station principally activates the automatic control in this particular arrangement the electric lights were turned off. From Table II one can observe that the difference between these two sets represents approximately the contribution from the electric lights alone, which is listed separately in the same Table. A more complicated control could be arranged to turn off the two sections of lights separately.

Cases 11 and 12 show additional data for a partly cloudly day. For these two cases and Case 5, extensive brightness data were also collected for the areas indicated in Fig. 2. Table III, presenting these data and certain ratios, serves to show the quality of the lighting that is obtained by daylighting alone and the combination of daylighting and electric lighting.

As mentioned above the automatic control used has certain advantages over other similar devices and they are as follows:

**TABLE II.—Interior Illumination Conditions.**

| Station | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | Lights A | Lights B |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Case | | | | | | Footcandles | | | | | |
| 1 | 130 | 62 | 61 | 88 | 61 | 50 | 64 | 62 | 48 | Off | Off |
| 2 | 82 | 44 | 41 | 57 | 38 | 30 | 41 | 40 | 30 | Off | Off |
| 3 | 67 | 46 | 51 | 62 | 41 | 43 | 53 | 52 | 42 | On | Off |
| 4 | 48 | 43 | 51 | 38 | 25 | 44 | 54 | 53 | 45 | On | On |
| 5 | 360 | 225 | 175 | 180 | 130 | 145 | 175 | 178 | 115 | Off | Off |
| 6 | 140 | 88 | 66 | 68 | 48 | 52 | 67 | 67 | 49 | Off | Off |
| 7 | 190 | 105 | 88 | 115 | 77 | 72 | 95 | 93 | 67 | Off | Off |
| 8 | 235 | 140 | 110 | 125 | 90 | 81 | 110 | 112 | 82 | Off | Off |
| 9 | 97 | 70 | 79 | 78 | 52 | 66 | 83 | 81 | 65 | On | On |
| 10 | 88 | 49 | 44 | 59 | 44 | 33 | 45 | 43 | 33 | Off | Off |
| 11 | 67 | 47 | 56 | 81 | 53 | 45 | 53 | 49 | 32 | Off | Off |
| 12 | 65 | 53 | 66 | 80 | 51 | 54 | 64 | 61 | 44 | On | Off |
| Electric Lights Only | 5.0 | 11.3 | 16.4 | 7.7 | 4.3 | 14.4 | 17.1 | 17.0 | 15.2 | On | Off |
| | 10.3 | 21.8 | 31.6 | 15.0 | 8.8 | 28.4 | 32.9 | 32.7 | 30.0 | On | On |

**TABLE III.—Interior Brightness Conditions.**

| Case | 5 | 11 | 12 |
|---|---|---|---|
| $b_1$ — 0° | 1600 | 275 | 250 |
| $b_1'$ — 45° | 860 | 165 | 150 |
| $b_2$ | 1900 | 540 | 490 |
| $b_3$ | 510 | 85 | 79 |
| $b_4$ | 145 | 33 | 31 |
| $b_5$ | 80 | 17 | 325 |
| $b_6$ | 120 | 22 | 25 |
| $b_7$ | 55 | 17 | 20 |
| $b_8$ | 170 | 80 | 77 |
| $b_9$ | 550 | 375 | 340 |
| $b_{10}$ | 85 | 20 | 21 |
| $b_{11}$ | 72 | 20 | 19 |
| $b_{12}$ | 700 | 385 | 350 |
| $b_{13}$ | 68 | 37 | 38 |
| Max. Ill. | 360 | 81 | 80 |
| Min. Ill. | 115 | 32 | 44 |
| Diversity | 3.1 | 2.5 | 1.8 |
| Ratios: | | | |
| $b_1/$Min. Ill. | 14.0 | 8.6 | 5.7 |
| $b_2/$Min. Ill. | 16.5 | 16.9 | 11.1 |
| $b_1/b_3$ | 3.1 | 3.2 | 3.2 |
| $b_1'/b_4$ | 5.9 | 5.0 | 4.8 |
| $b_5/b_6$ | 0.7 | 0.8 | 9.3 |
| $b_9/b_8$ | 3.2 | 4.7 | 4.4 |
| $b_{12}/b_{13}$ | 10.3 | 10.4 | 9.2 |

1. The lights are controlled by the illumination of a relatively small portion of the working plane and not by the brightness of some of the more remote room surfaces. In this manner the lights can actually be controlled by the illumination of the darkest portion of the working plane.

2. The phototubes can be physically separated from the amplifier so as to place the former near the working plane and the latter in some enclosed recess.

3. The control unit incorporates a time-delay relay so as to prevent frequent switching on and off of the lights in case of rapidly alternating exterior illumination conditions, such as is caused by a cloud rapidly passing over the sun.

4. The unit can be arranged to operate the lights in two or more sections thus providing a saving in power consumed.

The automatic control, diagramed by Fig. 3, has two separate controls; one to select an illumination level at which each portion of the electric lights will be turned on and one at which both portions will be turned off. As mentioned above the photocell of this control views the region around station 3. When this room was planned it was expected that this station would represent minimum illumination conditions. However, due to the fact that the wall reflectances were made lower than originally planned the minimum illustration occurred near the walls as can be seen from the data of Table II. Instead of moving the photocell to a new location the controls were set to a value at Station 3. which would cause the lights to come on when the illumination at Station 9 reached 30 footcandles. In an actual installation it would be preferable to have the photocell view the darkest portion of he working plane.

The data given above show the exterior illumination values that control the two sections of electric lights. From the survey of exterior illumination which has been in process for more than three years, sufficient data has been tabulated to indicate the percentage of time that each section of electric lights would be required during the school year.

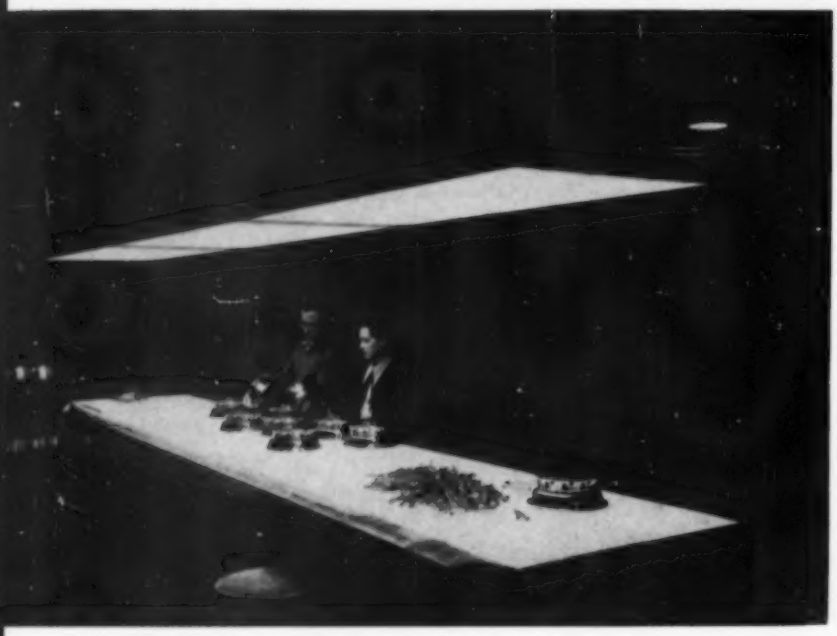
Considering 180 days extending from September through May and seven hours each day, 8:30 to 3:30 p.m., the data show that 31 per cent of the time the sky was overcast, 33 per cent partly cloudy and 36 per cent clear. These data agree fairly well with the corresponding data compiled by the U. S. Weather Bureau.

By studying the illumination record for each day it was found that the exterior vertical surface illumination for all surfaces was below 500 footcandles 17 per cent of the school hours, below 1000 footcandles 29 per cent of the time and above 1000 footcandles 71 per cent of the time. These values include the amount of light in each case that is reflected from a foreground having an average reflectance of 20 per cent. This type of foreground is about average for the north-central states but it is low for the United States as a whole.

The first half of the electric lights are required when the exterior V.S.I. reaches 750 footcandles, the data indicated that this will be the condition about 23 per cent of the time. The second half is required when the exterior V.S.I. reaches 450 footcandles, thus the data indicates that the second portion of the electric lights will be required about 15 per cent of the school year.

The research work that relates to this paper indicates that it is possible to satisfactorily control the electric lights in a school classroom by using a control unit that incorporates a time delay and a brightness differential. The data presented in this paper indicated that by controlling the electric lighting automatically a satisfactory level of illumination, and thus a better visual environment, can be maintained at all times. In addition it is quite likely that a considerable saving can be made in the cost of operating the electric lights by using such an automatic control, especially as all classrooms in a school having similar exposures are handled by one control unit.

1. Daylighting in Classrooms, R. A. Boyd, ILLUMINATING ENGINEERING, Vol. XLVII, No. 1 (January 1952).
2. The Attainment of Quality Daylighting in School Classrooms, R. A. Boyd, ILLUMINATING ENGINEERING, Vol. XLVIII, No. 1 (January 1953).
3. Daylighting with a New Kind of Functional Skylight, R. A. Boyd, John Lyon Reid, ILLUMINATING ENGINEERING, Vol. XLIX, No. 4 (April 1954).



Assembled lighting unit mounted 6 ft 4 inches over inspection table. Note uniform brightness of illumination and relaxed expression of inspectors.

# Design of a Chrome Inspection Lighting Device

By FLOYD SELL and DUNCAN PRESTON

**To solve a recurring inspection-lighting problem, two utility lighting engineers designed a device for chrome inspection. To make it readily available to the chrome plating industry at minimum cost, a plan was established for distribution of the component parts and do-it-yourself assembly.**

ONE of the most difficult operations faced by manufacturers is the inspection of highly specular surfaces. Of all such surfaces to inspect, chrome plating is probably the most difficult. Its very purpose is usually to beautify and enhance the appearance of an object; this in itself subjects it to particular scrutiny by the consumer, who will complain about the smallest defect. With the increasing use of chrome for decorative purposes it becomes more and more important that not even the slightest defect leave the shop.

Suppliers of such plating have found that it is an expensive operation to ship parts to the assembly plants only to have a large percentage returned for credit because of defects not observed by normal inspection. To overcome this vicious cycle, a lighting device was designed recently, which will show up and emphasize for ease of inspection, practically any flaw that might be the basis for a reject.

AUTHORS: Detroit Edison Co., Detroit, Michigan.

## Design Technique

Experiments conducted over a period of two years have proved that a large area of low brightness well-diffused light is necessary for the quick detection of plating flaws during production inspection. A unit incorporating this principle was designed for ready availability to the plating industry. Basically the unit consists of a frame fabricated of commercially available steel channel, using two-lamp 85-watt fluorescent industrial luminaires, which are also easily obtained commercially. The luminaires rest on ledges formed by the steel

channel frame, and flashed opal glass or corrugated vinyl plastic, obtainable in rolls, is added as a diffusing medium. One advantage of the plastic diffuser is in the pattern of the corrugations reflected in the plating; slight indentations are quickly recognized because they reflect a distorted pattern. The accompanying photographs show details of the unit's construction.

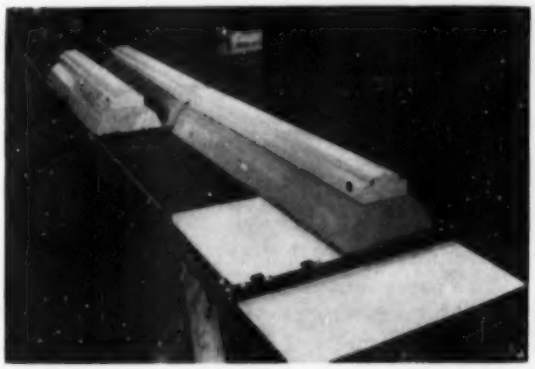
The unit is obtained knocked down, in either 5-, 10- or 15-foot lengths, and may be assembled by one man in about 30 minutes.

For most operations the cost of a special lighting device, if farmed out to a fabricator and patented, would be considered prohibitive. It was deemed wiser, therefore, to give the design to the industry and let each user order the parts necessary and assemble the unit himself. This procedure lowers the cost to a point where it is economical for even the smallest shop to own one.

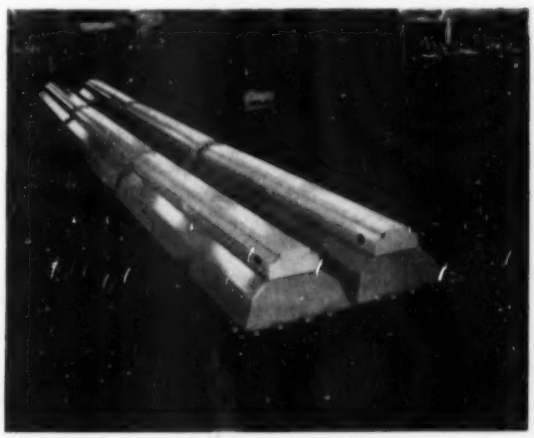
There are only three components to obtain, for any of the three sizes. First, the frame is ordered by a drawing number which is a package unit delivered with all necessary bolts and corner brackets. Fluorescent luminaires are ordered from his own supplier and flashed opal glass or vinyl plastic rolls may be obtained from a local dealer. The only additional material needed is some quarter-inch by half-inch rubber gasket with adhesive on one side, which may be obtained from a local auto supply or hardware store. This stripping is laid on the frame in such a way as to cushion and seal the fluorescent luminaires.

A shop owner and/or his inspector may bring his product to the utility office to inspect it under the permanently installed demonstration unit. Upward of fifty shop owners in the Detroit area have installed the inspection device following its demonstration on their material. Other locations may wish to avail themselves of this lighting technique.

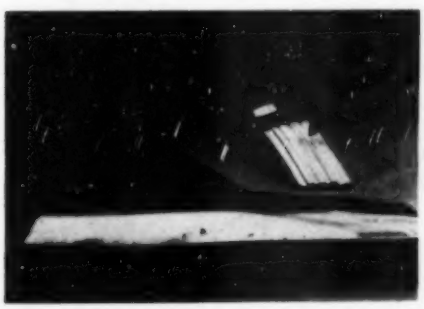
**STEP 1** — Supporting steel channel frame work is assembled, ready for placement of luminaires and diffusing material.



**STEP 2** — Luminaires placed on frame work; diffusing glass inserted in slot provided in frame. When corrugated vinyl plastic is used, installation is made by sliding it into the channel after the unit is raised to proper height and lamped.



**STEP 3** — Luminaires in place, assembly ready for hanging.



**Defective spot where chrome does not properly cover (arrow) shows up readily and is quickly detected.**

# Modern Ideas on Nomenclature

By DOMINA EBERLE SPENCER

RECENT PAPERS[1,2] have indicated a praiseworthy interest in the improvement of nomenclature for the Illuminating Engineering Society. It is now twelve years since the appearance of the last official publication[3] of the Society on this subject. In all this time, the I.E.S. Nomenclature Committee has kept its silence. At long last, the current chairman of the Nomenclature Committee has solicited[1] general discussion on the basic concepts of illuminating engineering. Perhaps it is time to think these problems through again and see if an improved set of standards cannot be developed.

As illuminating engineering progresses from the footcandle criterion to the specification of the luminous environment, the inadequacy of the accepted nomenclature becomes increasingly troublesome. Unless suitable modifications are made, the antiquated official nomenclature will seriously handicap future progress in lighting design.

This paper reviews the basic principles in terms of which the various proposals should be evaluated. It indicates sources of confusion in nomenclature and it shows how this confusion can be eliminated.

## Basic Principles

Any system of nomenclature should have three cardinal characteristics:

(1) Simplicity,
(2) Precision,
(3) Generality.

It is obvious that the illuminating engineer can save time and eliminate confusion by employing a *simple* system of concepts. Strict economy should be observed in the number of concepts employed.

Though the engineer may not always take the trouble to express himself precisely, there are times when the ability to do so is of paramount importance. It is essential for the basic concepts to be defined in a *logical, unique,* and *precise* fashion so that illuminating engineers may be provided with a suitable vocabulary for the exact expression of thought.

If a new set of concepts or definitions is formulated, it should be designed for permanence. The concepts should be sufficiently *general* to handle all situations that can be imagined. Fundamental concepts should not be made dependent on special cases such as perfect diffusion, surface (not volume) sources, or non-absorbing, non-scattering media. Concepts should be of great *generality,* so that the same ideas can be used by the illuminating engineer, the astronomer, the photographer, the television engineer, the physicist, the meteorologist, the physiologist, and the psychologist. Furthermore, the concepts should be valid not only for contemporary problems, but should also be formulated for the illuminating engineer of the year 2000. A simple, precise, and general set of concepts will provide maximum utility with a minimum of effort.

## Parallel Families of Concepts

It is generally recognized that analogous concepts are needed for radiometry and photometry. When all wavelengths are treated on an equal footing, as in solar heating or in the specification of the optimum thermal environment for human beings, measurements are made with a non-selective receiver. The world is regarded through the eyes of a thermocouple on a bolometer. The concepts used to describe the spacio-temporal distribution of the radiation are then called *radiometric concepts.*

The response of the human eye to its luminous environment requires another set of concepts. The radiation must now be weighted with respect to the response curve of the eye, $y(\lambda)$. Thus a new set of concepts is obtained, called *photometric concepts.*

Other receivers exhibit still different spectral response curves, $\omega(\lambda)$. To each curve $\omega(\lambda)$ corresponds a new family of concepts. Thus, we may have erythemal, germicidal, or photographic concepts. All of these families of concepts employ exactly analogous spacio-temporal relationships. The principle of simplicity requires that *analogous concepts* be used with *all types of receiver.* The families should be distinguished only *by appropriate adjectives,* such as "radiometric," "photometric," or "erythemal."

The parallelism between the photometric and the radiometric concepts is recognized[3] in the I.E.S. Standards, but the possibility of simplicity has not been employed to full advantage. The I.E.S. defi-

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nitions use *twice the number of names* that are needed. Yet the system is also incomplete, since no names are provided for the families of concepts pertaining to receivers other than the thermocouple and the eye.

### Converging or Diverging Lightcone

Concepts having to do with the angular distribution of radiation are formulated sometimes in terms of the converging lightcone, sometimes in terms of the diverging lightcone. For an infinitesimal light source and an infinitesimal receiver, it is true that one can define both a converging and a diverging lightcone. But as soon as the source is of finite size, the diverging cone is no longer defined. Is the apex on the surface or behind it? Where is the apex of this fictional lightcone? How can it be defined for a volume source? But the apex of the converging lightcone can always be defined, and thus the converging cone should supplant the antique idea of a diverging cone. The latter is, of course, a relic of the days of candle light. With a candle flame, the ambiguity associated with the apex of the diverging cone was not very noticeable, but with modern sources having large surface areas, the old ideas become completely meaningless. Also, the diverging cone and a measurement of radiation leaving the source give no information on the radiation received at any point in an absorbing or scattering medium. Concepts defined in terms of the diverging lightcone are thus seen to lack the important attribute of *generality*.

Concepts defined in terms of the *convergent* lightcone and a measurement of radiation received apply to any light source and to all types of media. If a surface source actually exists, angular characteristics of the *source* are merely a special case of the general concept defined in terms of the converging lightcone — the special case that occurs when the distance from source to receiver is so small that the effect of the intervening medium may be ignored. Consequently, one may conclude that the most general and the most useful concepts can be defined in terms of the converging rather than the diverging lightcone.

### Concepts and Units

The illuminating engineer has the habit of speaking of units when he means concepts. He often talks of "keeping the footcandles up" rather than the illumination, or of the lumen-output of a lamp rather than the luminous flux from the lamp. Nevertheless, when he comes to the consideration of the basic systems of nomenclature, he will find it advantageous to make a clear distinction between concept and unit.

A concept is an idea that enters our discussion so often that we want to give it a definition and a name. Concepts may be defined by describing a process by which they can be measured. Concepts may also be described by equations. Length, for example, is a concept. It may be defined by describing the process of measuring distances with a standard of length such as a meter-stick. Length may be described in terms of many different units. The idea is the same, the concept is the same whether the measurement is expressed in meters, feet, yards, knots, or earth-quadrants.

If a concept $A$ is defined by an equation in terms of other known concepts $B, C, -----, Z$,

$$A = k \cdot f\,(B, C, -----, Z) \qquad (1)$$

where $f$ is a specific function of the known concepts, an arbitrary constant $k$ may be included without changing the *idea* that is to be expressed. Frequently, the constant $k$ is defined in such a way that a certain special case takes on an especially simple form. The most frequently used special case may be written in such a way that the constant disappears altogether. This does not mean that the general definition of concept $A$ applies only to the special case. It merely means that the size of the unit is changed. Constants such as $4\pi$ or $\pi$ are often included in the definition of a concept. They are entirely arbitrary. Whether they are included or not, the *concept remains the same*. Only the *unit* in terms of which the concept is expressed is different.

### Active and Passive Concepts

It has been found useful[4] in physics and electrical engineering to make a distinction between *active* and *passive* concepts. Active concepts are associated with the presence of energy. Examples are force, current, potential difference and power. Passive concepts are properties of a device and have nothing to do with the presence or absence of energy. Examples are resistance, inductance and capacitance, reflectance, transmittance, absorptance and interflectance.

In electrical engineering, it has been customary to reserve the word ending, "-ance," for a passive property of a device. This procedure is followed in illuminating engineering with the words "reflectance," "transmittance," "absorptance," and "interflectance." There are many advantages in being consistent in the application of this rule. If "-ance" is to be reserved for passive concepts, then it must be specifically forbidden for such active concepts as luminous flux, illumination, and brightness.

**TABLE I.—A Simple System of Nomenclature.**

| Radiant Concepts | Luminous Concepts |
|---|---|
| Radiant pharos, $F_r$ (watt) | Luminous pharos, $F_l$ (lumen) |
| Radiant pharosage, $D_r$ (watt $m^{-2}$) or (watt $foot^{-2}$) | Luminous pharosage, $D_l$ (lumen $m^{-2}$ = lux) or (lumen $foot^{-2}$ = footcandle) |
| Radiant helios, $H_r$ (herschel) or ($\pi$ watt $foot^{-2}$ $steradian^{-1}$) | Luminous helios, $H_l$ (blondel) or (footlambert) |

## A Simple System

A large fraction of the terminology required for illuminating engineering is covered by the three terms shown in Table I. The system was set up[5] in conformity with the foregoing precepts. Only three words and three basic ideas must be mastered. Terms in the first column differ from those in the second column only in the modifying adjectives. Both columns use the same word and letter, distinguished where necessary by the adjectives "radiant" and "luminous" and by the subscripts $_r$ and $_l$. Such a system of parallel concepts provides more simplicity and economy than the sets of concepts used in the I.E.S. Standards.

The first concept is *radiant pharos*, $F_r$ (sometimes called radiant flux). It is merely power in radiant form and is expressed in *watts*. It is useful, for example, in specifying the total power radiated by an incandescent lamp. We may say that the radiant pharos from a specific incandescent lamp with power input 200 watt is 180 watt. Radiant pharos is also useful in specifying the total power received by a specific surface. The radiant pharos entering a building through a sunlit window may be 2000 watt or the radiant pharos received by a thermocouple junction may be a microwatt.

*Luminous pharos* is merely radiant pharos weighted with respect to the lamprosity (visibility, luminosity) curve of the human eye. The size of the unit is quite arbitrary. It is customary to employ the *lumen*. We say that the luminous pharos radiated from a luminaire is 10,000 lumens or that the luminous pharos received by a photocell is 0.001 lumen.

It is also useful to be able to specify radiant or luminous flux density. The ending "-age" has been introduced[5] to denote "per unit area." Thus, pharos per unit area is called simply *pharosage*.

*Pharosage* is, in general, a *vector quantity*. At any point in space the pharosage vector $D$ points in the direction of flow of energy. The magnitude of the pharosage vector is the pharos per unit area crossing an imaginary surface perpendicular to the vector $D$. Vanishing of the pharosage vector is not, however, synonymous with absence of radiation. Consider a plane midway between two identical light sources. If the plane is opaque the values of *incident pharosage* on both sides of the surface are identical. If they are added vectorially they cancel on the plane of symmetry. The significance of the vanishing of the pharosage vector may be

(a) no radiation is present at the point, or

(b) as much radiation travels from left to right as from right to left.

The concept of pharosage is also used in two other ways. It may be used to calculate the *incident pharosage* on a surface. The incident pharosage is the component normal to the surface of the sum of the pharosage vectors for all sources which illuminate the surface. Incident luminous pharosage is often called *illumination*.

It is also convenient to speak sometimes of the pharosage reflected from a surface. For example, the "brightness" of a perfectly diffusing surface is numerically equal to the luminous pharosage from the surface. This is another special case of the pharosage vector. Here we take the component of the pharosage vector in the direction of the outward-drawn normal to the surface.

Incident and reflected pharosage represent components of the pharosage vector on two sides of the same surface. They are measures of the flow of energy in two opposite directions. Both are special cases of one and the same physical concept in the same sense as the input current to an amplifier and the output current from the amplifier are both currents. Another analogy is the fact that your income and your expenses are both amounts of money.

The third concept needed is *helios:*

$$H = k \lim_{\omega \to 0} \frac{D_m}{\omega}. \qquad (2)$$

The helios is a function of both position and direction. As you sit in a given position in a room you can look about and estimate the helios in any direction. By the definition given in Eq. (2), the helios is directly proportional to the ratio of the incident pharosage $D_m$ on a surface perpendicular to the line of sight and the solid angle $\omega$ through which the light arrives at the receiver. In order to obtain a unique specification of the helios at a point $P$ and in a given direction, the solid angle $\omega$ must be reduced until the field of view subtended is uniform. When the field of view is uniform and the solid angle is small, the ratio of $D_m/\omega$ is a constant, independent of the size of the solid angle.

The constant $k$ is arbitrary. It can be chosen as unity or $\pi$ or any other convenient value. The *unit*

of helios depends on the choice of $k$, but the *concept* is the same irrespective of what value of $k$ is employed. The value of $k$ should be chosen in such a way that the relation most often employed will be as simple as possible. If we choose $k = \pi$, then the helios $H$ of a perfectly diffusing surface is numerically equal to the incident pharosage $D$ times the reflectance $\rho$,

$$H = \rho D. \tag{3}$$

As this equation occurs more often than any other in practical illuminating engineering, it is advantageous to choose $k = \pi$. Then Eq. (3) is as simple as possible and Eq. (2) is written

$$H = \pi \lim_{\omega \to 0} D_\omega/\omega. \tag{2a}$$

If the unit of length is the *meter*, the unit of radiant helios is

$$\pi \text{ watt } m^{-2} \text{ steradian}^{-1} = 1 \text{ herschel}$$

and the unit of luminous helios is

$$\pi \text{ lumen } m^{-2} \text{ steradian}^{-1} = 1 \text{ blondel.}$$

On the other hand, if the *foot* is employed as the unit of length, the corresponding unit of radiant helios is

$$\pi \text{ watt foot}^{-2} \text{ steradian}^{-1}$$

while the unit of luminous helios becomes

$$\pi \text{ lumen foot}^{-2} \text{ steradian}^{-1} = 1 \text{ footlambert.}$$

The concept of helios is actually familiar to the illuminating engineer. He has some experience with the Luckiesh-Taylor Brightness Meter, the Macbeth Illuminometer, the Freund Photoelectric Brightness Meter, or the Weston Exposure Meter. All of these instruments measure *helios*, not brightness as defined by the I.E.S. or luminance as defined by the O.S.A. The meters operate equally well whether pointed at the sky or at a wall, and they certainly include the effect of atmospheric absorption and scattering. The meters measure what the eye sees as it looks in different directions from a given point. As *helios* is what the illuminating engineer measures, there seems to be no valid excuse for the present confused definitions based on non-existent candles sitting on a surface.

If the above simple set of concepts were accepted by the I.E.S. as the basis of illuminating engineering, the subject would be greatly facilitated. Such terms as "illumination" and "brightness" would undoubtedly continue to be used in a popular sense. But in the teaching of illuminating engineering and whenever precision of thought is desired, an adequate set of concepts would be available for use.

The same base words as are used in Table I may also be extended to systems employing other weighting functions by the addition of appropriate adjectives and subscripts. We can have, for example, erythemal helios, $H_e$, photographic helios, $H_p$, etc.

### The Fry Proposal

In a recent paper,[2] Professor Fry has proposed the recognition of both the concept of *luminance* and the concept of *helios*. He explains the distinction between the two concepts and shows a thorough understanding of both. If the concept *luminance* is to be recognized at all, the Fry proposal is a good one. There are, however, a number of reasons why the concept of *luminance* is not of any practical value to the illuminating engineer. *Luminance* is defined in terms of a diverging lightcone while *helios* is defined in terms of a lightcone converging toward the receiver. Consequently, in the general case of an arbitrary intervening medium *luminance* has nothing to do with what we see. At best, it is applicable only to the special cases of surface sources and perfect media. The concept of *helios*, on the other hand, is sufficiently general to cover all cases.

*Luminance* is *numerically* equal to helios if the helios of a surface is measured at a point sufficiently close to the source so that absorption and scattering can be neglected. As *luminance* is merely a special case of helios, it has no raison d'être. Two terms are *never* needed.

Another disadvantage of *luminance* is the very name of the word. In the first place, the ending is not in accordance with electrical-engineering conventions. While the concept is *active* the ending is that ordinarily used for *passive* concepts. In the second place, if it is used together with the word "illuminance," the two words are essentially indistinguishable in spoken English. In the third place, if used with "radiance," the parallelism of radiometric and photometric concepts is not employed to full advantage.

If action were taken on the Fry proposal, one would expect the concept of *luminance* to die a natural death. It would be a more straightforward procedure to discard *luminance* at the outset as there appears to be no valid reason for its introduction.

### The Finch Study

The study[1] of nomenclature published recently by Professor Finch has a number of merits. Professor Finch recognizes the distinction between active and passive concepts and the parellelism between radiometric and photometric concepts.

It is, however, hampered at the outset by the assumption that distances are always small enough

to eliminate absorption and scattering. This is not true in the lighting of Madison Square Garden. It is not true in Professor Finch's own studies of night driving. And it is certainly not an effective assumption from which to develop the basic nomenclature of the Illuminating Engineering Society.

He is also hampered by a strange addiction to the candle. Although there are no candles sitting in the center of each square foot of a surface, Professor Finch seems to think that brightness must be defined in terms of imaginary candles. This type of definition cannot form a satisfactory starting point as it is a fiction to begin with. The use of discrete candles flickering on the wall does less than nothing to aid in the visualization of the concept. And it cannot be made rigorous. Yet Professor Finch says that only such units as the candle/in$^2$, candle/ft$^2$, etc., may be considered in specifying photometric brightness.

Professor Finch's list of concepts is not complete, yet it is also redundant. The luminous pharosage incident on a surface is called *illumination;* the luminous pharosage reflected from a surface is called *emittance.* In his teaching of electrical engineering, does Professor Finch call the current into a battery by one name and the current flowing out of it by another? Employing different names for two special cases of the same concept is neither economical nor convenient. Also, Finch's use of different words for corresponding photometric and radiometric concepts serves to double the number of words that must be memorized and distinguished.

Another disadvantage of the Finch system is the frequent use of the concept of *intensity.* Actually this concept applies to a real source only if one stays infinitely far away from the source. Antiquated photometric laboratories have developed convenient techniques for obtaining candlepower curves. The existence of many such curves, however, does not make them useful. At finite distances, a knowledge of intensity gives no useful information. A concept which is significant only at infinity is not suitable as a foundation for nomenclature. The less it is used, the sooner the illuminating engineer will be able to think in terms applicable to modern photometry.

The immense advantage of the converging lightcone does not seem to be recognized by Professor Finch. The diverging lightcone gives information useful in further lighting calculations only if the receiver is infinitely far away. The converging lightcone, on the other hand, is always significant and forms the basis of the powerful unit sphere method[6] of calculating pharosage.

The most confusing portion of the Finch paper is that devoted to brightness. Instead of employing a single, clear, general definition, Finch deals with five. His statements that brightness is a fundamental property of the source in a given direction, and that brightness can be defined in terms of either source or receiver are not valid in the general case. Their validity depends on the restrictive assumption of a non-absorbing, non-scattering medium and of a surface source. The statements are invalid in such familiar examples as the sky (where is the surface?) or in the fogs which prevail near Berkeley. His definition (e) is equivalent to the definition of helios given in Eq. (2) with $k$ arbitrarily set equal to unity. It is hard to see any advantage in including four other definitions.

Professor Finch is in error when he concludes that the use of rationalized brightness units changes the concept. There is properly only *one* concept of helios. The concept is the same whether we choose to include a $\pi$ or not. Only the unit is changed. The Lambert System, as a distinct brightness concept, is a figment of Professor Finch's imagination. It has no existence independent of the basic definition of helios.

## Summary

To summarize, I believe that the Nomenclature Committee can be of immense service — not only to illuminating engineers but also to everyone who uses light—in producing a new and better nomenclature. But to be really valuable, this revised nomenclature must be simpler than the present I.E.S. Standards, it must be more general, and it must be more precise.

A suggested set of concepts is given in Table I. The complete set of radiometric and photometric concepts are handled by means of only *three* names, which contrasts strongly with the complicated and illogical systems that are now in use. Despite this simplicity, however, the proposed system is of greater generality than the old and is much more precise. The paper concludes by pointing out some of the difficulties in the proposals of Fry and Finch.

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## DISCUSSION

WILLARD ALLPHIN*: If the problem were merely one of deciding what to name a quantity, the nature of which was agreed to by everyone concerned, it would not seem worthwhile to change familiar names merely for the sake of more logical word construction. However, if it is true that some of the words now in use lead to misunderstanding or confusion, then we should change them even if it involves some awkwardness during the transitional period.

It seems to me that Dr. Spencer makes a good case for the need of change, and I suggest that the I.E.S. take the lead in the following:

(1) Determine whether or not present nomenclature does cause confusion or error.

(2) If so, establish a new and logical nomenclature.

(3) Require the new nomenclature in I.E.S. papers but, for perhaps five years, print the old term in parenthesis after each use of a new term.

H. L. LOGAN**: Perhaps I misunderstand Dr. Spencer's paper; but from my reading of it, I feel that Miss Spencer's antagonism to the concept of candlepower intensities is based on her pre-occupation with the very narrow part of the field in which she specializes. From a theoretical standpoint, the brightness concept as she develops it in Eq. (2) is based on the same kind of generally accepted application of differential calculus as the candlepower intensity concept. There seems to us no difference in making approximations for practical measurements whether it be for the determination of brightness as Dr. Spencer proposes or for the determination of candlepower as a basic standard.

The candlepower standard is fundamental for the calibration of all light measuring instruments. Any footcandle or brightness meter regardless of how it is used in practice is calibrated in the first place against the standard candlepower sources.

Denying the practical use of candlepower in application engineering is to ignore the wide field outside her range of interests. There is a host of equipments and applications in lighting science and in practical field applications where candlepower intensity is most useful and entirely adequate for finite test distances, for the calculation of zonal lumen output values, and for point-by-point illumination results. The concept of candlepower is, for example, particularly useful for most luminaires in the field of industrial, flood, spot and outdoor lighting, and for the performance evaluation of all kinds of light signaling devices for railroads, traffic, aviation lighting, etc.

W. B. BOAST†: In general I would agree with the majority of the ideas presented by Dr. Spencer in her paper, if we were starting at the beginning in establishing names of concepts and of units in a completely new science. However, I can not believe that the present nomenclature in illumination is quite so bad as she would have us believe, provided careful use is made of the present concepts and units. The question that needs to be decided before a major upheaval is made is: "Will the science of illumination be enhanced or hindered by the change?"

Many of the very sound theoretical proposals of Spencer and Moon can be reconciled with our present nomenclature if these present concepts are not loosely used. An example will illustrate my point. The usual relationship among illumination, brightness and solid angle is:

$$B = \frac{k}{\cos\beta} \cdot \frac{dE}{d\omega}$$

where $B$ is the brightness of the source

$dE$ is the differential illumination at a receiver point on a real or imaginary surface

$d\omega$ is the differential solid angle converging at the point on the receiver surface

$\beta$ is the angle between the normal to the receiver surface and a line in the direction for which $B$ is expressed

$k$ is a dimensionless constant whose value depends upon the units employed.

This is the same basic equation given partially by Spencer in her Eq. (2), except hers is restricted to a perpendicular receiver surface. Spencer uses different symbols and different names for some of the same concepts named above. Specifically the question that demands an answer is: "Will calling brightness 'luminous helios' and calling illumination 'incident luminous pharosage' result in clearer thinking by both the theoretical and practical illuminating engineer?" I do not believe that clearer thinking will be achieved. In fact, I believe that such a change would result in a complete cleavage between the theoretical and practical engineer. Some theoretical engineers might use the new names if they were officially sanctioned, but many more of this group would still attempt to write for and converse with the practical engineer. Hence, there would be a dual language requirement. This would be a most unfortunate situation.

If the present concept nomenclature could not be used for basically sound concepts, then a change would be in order; but I frankly do not believe that the present nomenclature fails in this respect. I apparently have a different viewpoint upon the idea of these concepts than does Dr. Spencer. How the I.E.S. chooses to list their definitions of these concepts is one matter. A consideration of the basic concepts and their names should be evaluated independently of the matter of definitions. The present I.E.S. definition of brightness is associated with the concept of intensity *which is not necessary*, but the basic concept of brightness is there regardless. Perhaps an improvement in the definition of brightness would be through the previously mentioned equation in terms of the concept of illumination, but I can see no reason to change the names of the concepts we now have.

LEONARD F. MARTIN:* Acceptance of an idea or a theory can never be fully realized unless it is fully understood.

I am in agreement with Dr. Spencer's summary. The I.E.S. Nomenclature Committee can be of immense service to everyone who uses light in producing a new and better nomenclature and one that is more readily understood.

The present nomenclature is becoming more difficult to use each day and there is a growing confusion in the minds of architects, engineers, and buyers of light. They are only being told part of the story. After working with the theories of Moon and Spencer for about six years, I could cite many cases of complete confusion. An engineer for a leading automobile manufacturer was trying to calculate for quantity, quality, and efficiency with a complete luminous environment and with a scattered lighting fixture system. He became so confused between the *I.E.S. Lighting Handbook* and Moon

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*Mariux Corp., Somerville, Mass.

and Spencer's *Lighting Design* that a decision was made to set two full size mock-ups.

He discovered that the *I.E.S. Lighting Handbook* did not cover all the ramifications, but the final results of his work with the mock-ups are not too important at the moment. The important fact, it seems to me, is that it appeared necessary for him to build a mock-up to test the conflicting data within the lighting industry.

Let us test them ourselves. Let us come up with a simplified theory and nomenclature that will work equally well when calculating the lighting of Madison Square Garden or the load dispatch board in a light and power company plant. I know for certain that this can be done more readily and more accurately by using the concepts of Moon and Spencer as set forth in Dr. Spencer's paper. The Nomenclature Committee might gather valuable information by taking a poll of past and present students of Professors Moon and Spencer and publishing their comments on the theory and nomenclature.

DOMINA EBERLE SPENCER:* The discussions show a variety of reactions and are indicative of the varying depths to which the commentators have carried their logical analysis of the nomenclature of illuminating engineering.

As is his custom, Willard Allphin has taken time to think the problem through before making an excellent statement. He realizes that thoughtful analysis is required in the establishment of nomenclature and suggests that the I.E.S. take the lead in this direction. With his conclusions I would differ in only one respect. Rather than "requiring" the use of the new and logical nomenclature, I would like to see its use *strongly encouraged*. Though it would be delightful to see all I.E.S. papers written in the best possible nomenclature, the traditional scruples of Quakers against coercion of any form seem to be applicable even in scientific publication. The author should have freedom to follow his conscience and to write in the form which seems best to him.

As Mr. Logan suggests in his first sentence, he has misunderstood the paper. He has entirely missed the difference between the diverging lightcone and the converging lightcone. He apparently feels that my criticism of the word "candlepower" is related to my former criticism of certain types of lighting which occupy a large part of his attention. May I point out that I would still find candlepower entirely unsuitable as a fundamental photometric concept, even if I had never dreamed of a luminous ceiling and thought downlights were the ultimate development in lighting fixtures.

Unfortunately for the devotees of the photometry of the Colonial period, it is possible to place even downlights in smokefilled rooms, and the rain falls on streetlights, railroad track and ball parks. No matter how loudly we cheer the word, "candlepower" can never tell us what the *eye sees*. If Mr. Logan will take the time to think the problem through, I suspect he may come to full agreement with me. The desire to have photometric concepts which are suitable for human use, which enable us to describe the light *received* by the eye, is surprisingly close to Mr. Logan's concern with luminous environments for human occupancy.

The calibration of our measuring instruments in terms of candlepower is an anachronism. Our "candlepower standards" are by no means the mythical point sources of the "inverse square law." Differential calculus is neither to be incriminated nor justified by its association with definitions of both helios and candlepower. I do not advocate necessarily that the concept of candlepower be entirely abandoned. As Mr. Logan points out there are applications such as streetlighting on clear nights where candlepower may be correctly used. But the whole system of photometry certainly should not be based on the crude ideas of Bouguer and Lambert of 1760.

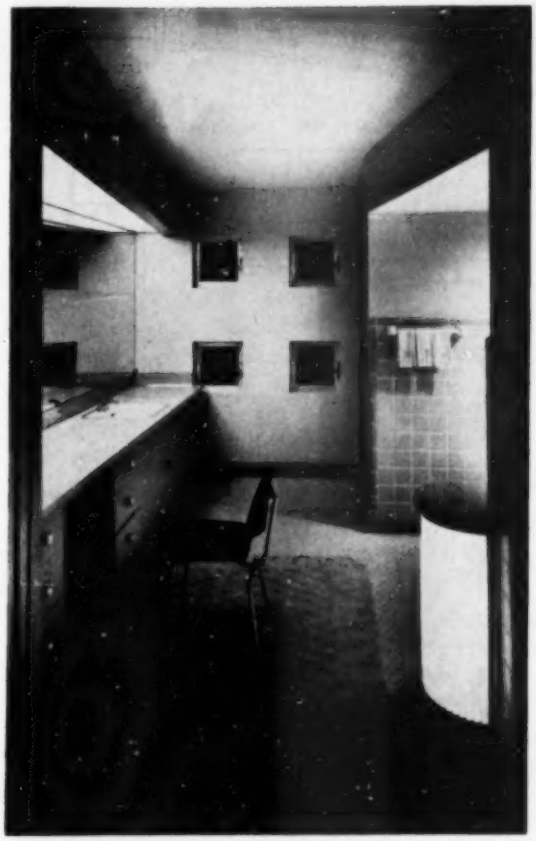
The concepts which Professor Moon and I have developed are not associated with any narrow branch of light. They are designed for use in all applications of light, from astronomy to photography, from clear media to a dense fog, from design of prismatic lenses to the study of interflections in enclosures. Not my field, but that referred to by Mr. Logan is very highly specialized. And it is only in this very specialized field that it is possible to retain the photometric concepts of Colonial days with some degree of satisfaction.

Professor Boast, who is one of the more progressive authors of textbooks in illumination, has understood much of the paper. Yet some of his comments are inaccurate. If we use the present I.E.S. definition of brightness and follow his precept of not using nomenclature loosely, it is impossible to write the equation quoted by Boast. Reference to standard I.E.S. definitions should refresh Professor Boast's mind on this point. Perhaps this is what Boast tells his classes brightness means but it is *not* the I.E.S. definition, which is confined to a diverging lightcone or to a perfectly diffusing source.

It is true that Professor Boast's definition of brightness is rather close to our definition of helios. Yet there is a small difference. Professor Boast's definition implies that the helios of a source in a given direction measured at a given point $P$ depends on the angle at which the receiving photocell is placed. This is *untrue*. The *helios* at a point $P$ in a given direction is the same no matter what the angle of the cell. The variation in dD (Boast's dE) compensates for the variation in cos $\beta$. Therefore Professor Boast's definition is not more general than that given for helios, but merely introduces an entirely irrelevant variable. It is exactly in such questions that confusion arises in both the present I.E.S. nomenclature and in Professor Boast's improved definition. Perhaps the greatest advantage of introducing a new, strange word is so that students, professors and practicing illuminating engineers may realize that *thought* is required, that a new *concept* must be learned. It is true that the I.E.S. could improve their definitions without changing the names of the principal concepts. But such a procedure would not lead to precise speech, for the confusion associated with the popular, the psychological, and the traditional I.E.S. usage would continue to cling to the reformed definitions.

Mr. Martin's comments are most encouraging. It is gratifying to find a practical illuminating engineer who not only recognizes the actual need for improved nomenclature but has demonstrated, in his own experience, the successful use of the nomenclature suggested in this paper over a period of years.

*Author.



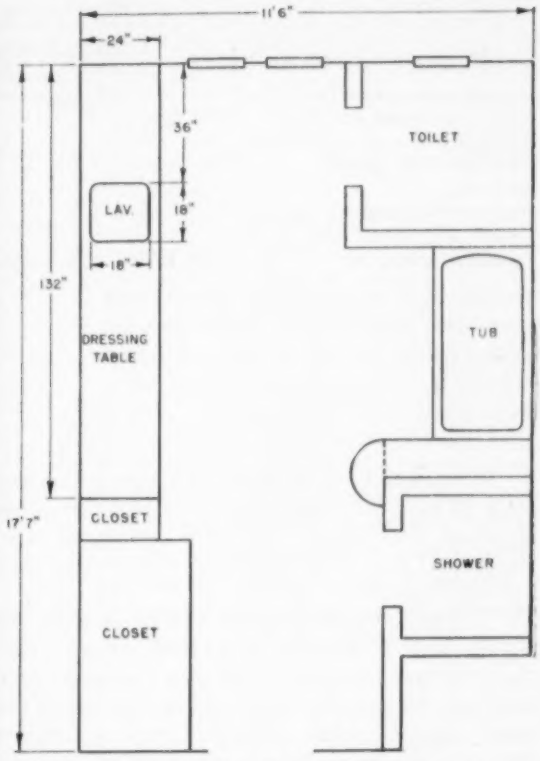



Figure 2. Plan view of bathroom.

**INSTALLATION IN RESIDENCE OF MR. AND MRS. JAMES STANSELL, NASHVILLE, TENN.**

# Lighting a Bathroom

**LIGHTING OBJECTIVE:** To provide general and local lighting in a large modern bathroom.

**GENERAL INFORMATION:** Lighting the main bathroom required analysis of the lighting needs in four areas in addition to general lighting — a built-in dressing table, shower, tub, and toilet. The bathroom is 17 feet 7 inches by 11 feet 6 inches. Along one wall is a built-in dressing table and lavatory. At the opposite side of the room are located the tub, shower stall and toilet enclosure. (See Fig. 2.) The walls and ceiling are soft pink (60% RF), the floor is pink ceramic tile (68% RF), and the wall area surrounding the tub is gray tile (46% RF) to a height of 54 inches.

**INSTALLATION:** The illumination for the 11-foot area consisting of dressing table and lavatory is provided by a luminous panel made of corrugated plastic installed at the bottom of a soffit which houses three rows of slimline deluxe warm white fluorescent lamps. Each row consists of one 72-inch and one 48-inch T-8 lamp operating at 425 ma. The lamps are mounted 6 inches above the plastic diffuser on 8-inch centers at one end and 2-inch centers at the other, following the architect's soffit line. (See Fig. 3)

The illumination at cheek level for a seated person (25 inches from mirror and 15 inches above the table top) measured 35 footcandles, with 70 footcandles on top of the head and 15 footcandles under the chin. Corresponding footcandle readings taken while standing at the lavatory, 22 inches from mirror and cheek level 32 inches above table top, show 40 footcandles at the cheek level, 80 on top of the head, and 15 under the chin.

*(over)*

A.I.A. File No. 31

## Lighting a Bathroom (Continued)

Brightnesses were as follows:

| | |
|---|---|
| Looking up at plastic panel when seated at dressing table | 290 ft-L |
| Reflected brightness of panel in mirror at top (seated) | 250 ft-L |
| Table top | 40 ft-L |
| Maximum brightness of luminous panel when viewed from sitting position in bath tub | 250 ftL |

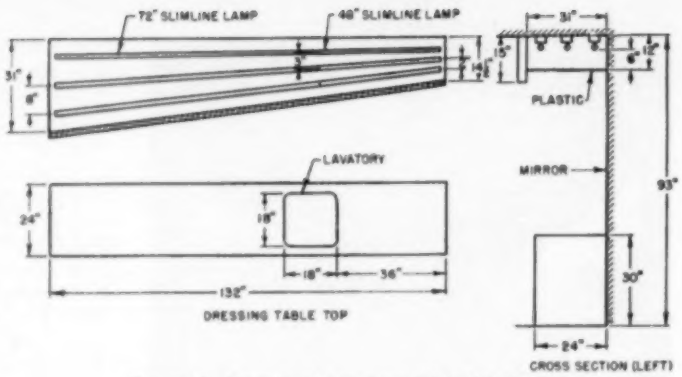



Figure 3. Details of dressing table lighting.

The general illumination, particularly for night time, is provided by a 20-watt T-12 soft white fluorescent lamp back of curved plastic shielding (see Fig. 4). This gives a soft glow of light over the floor of the passageway in the bathroom. The surface brightness of this unit is 125 footlamberts.

A Virden V-220 unit with 40-watt incandescent lamp is installed in the shower stall. Recessed in the ceiling over the bath tub is one Swivelier No. 1811 luminaire with a 275-watt sun lamp. In the toilet enclosure is installed one Halcolite 1102 bracket mounted on the wall 6 feet 3 inches above the floor, using a 100-watt white incandescent lamp; a Circilite 505 ozone-producing lamp is also installed in this space.

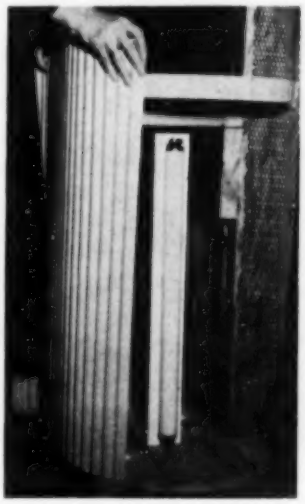
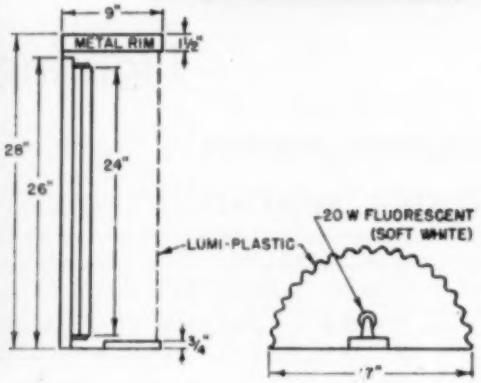


Figure 4. Night light.




**Architects: Hart, Freeland and Roberts, Nashville, Tenn.; electrical contractor: Stansell Electric, Nashville, Tenn.**

**Lighting data submitted by May Love Gale, Home Economist, Tennessee Valley Authority, Nashville, Tennessee as an illustration of good lighting practice and to aid in the design of similar installations.**

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# Use of High Speed Computing Devices In Photometric Calculations

By G. A. HORTON

**The purpose of this article is to illustrate the development of an efficient and routine method for handling the calculations involved in the analysis of photometric tests of asymmetric luminaires. Principles of IBM punched card accounting machines are reviewed briefly. The specific example given is that of the application to street luminaire photometry where many laborious calculations are involved. Previous methods of solution of the problem are reviewed; other applications to photometric and illumination calculations are suggested.**

CALCULATIONS in this study are performed in two parts. The first part, which involves many simple independent calculations, is worked on the IBM Type 605 Electronic Calculator in conjunction with the Type 521 Summary Punch. These two units taken together are well adapted to handle calculations of this type. The second part of the calculations which involves intricate summations of the first part, is worked on the IBM Card-Programmed Electronic Calculator (CPC), using a general purpose fixed-decimal control panel.

The 605-521 unit converts the photometer readings to candlepower, the candlepower to zonal lumens, and to footcandles on the plane of the street. The CPC sums the lumens by quadrants, converts the lumens to effective lumens for six given ratios of mounting heights to transveres distances, sums these effective lumens according to street size and house side, computes the utilization efficiencies for each of these summations, and finally gives the total efficiency of the luminaires. All these calculations are performed in two runs totalling approximately one hour's time, one run of 462 cards on the 605-521, and the other of 1335 cards through the CPC.

The machine time involved is compared to the man-hours of technician time at the desk to accomplish the same result.

### Principles of IBM Punched Card Accounting Machines

Punched card computing equipment and its use in many scientific and statistical problems has been described adequately in the literature.[1] However, the application of this equipment to photometric and illumination calculations seems to have been completely overlooked, so this article will be devoted exclusively to such problems.

Punched card computers were originally developed for business accounting applications, but have been successfully utilized, without major alterations, in scientific work. Among the advantages to be gained is a speed in excess of that attainable with desk calculating machines, increased accuracy due to the fact that their automatic operation does not weary of tedious iteration, and conservation of engineering manpower.

The basic unit for the automatic operation of this equipment is the IBM card. The standard card is 3.250 inches by 7.375 inches by 0.0067 inch thick, and one corner is cut to facilitate handling, matching and filing. These cards have 80 vertical columns each with 12 punching positions. The 80 columns are punched and read independently, each punched column denoting one digit, one perforation being required for each digit.

Machines used in the problem at hand and their functions are as follows:

Source data are introduced into IBM cards by means of the manually operated Type 31 Card Punch (see Fig. 1-A). The operator reads the data sheet, and by depressing keys, automatically converts the information into punched holes. The operator is normally not concerned with the card, since the machine feeds, positions, and ejects cards automatically. The operator's primary concern is to depress the proper keys in the correct sequence. This is basically the same type of function as

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**Figure 1. IBM machines.**

**A — Type 31 Card Punch**
**B — Type 514 Reproducing Punch**
**C — Type 605 Electronic Calculator**
**D — Type 521 Summary Punch**
**E — Type 82 Punched Card Sorting Machine**
**F — Type 77 Punched Card Collator**
**G — Type 412 Accounting Machine**
**H — Type 941 Supplemental Storage Units**
**I — Interpreter**
**a, b, c — cables**
**CPC consists of C, D, G, and H**
**Type 605 Electronic Calculator — Type 521 Summary Punch when used separately consist of: C and D**
**Auxiliary Machines: A, B, E, F, and I**

typing, or other key driven operations. Duplicating may be performed as part of the card punching function. Instead of depressing keys repetitively for common information, such as a test number or date, which is to be punched in every card, the operator punches the common information only once and the machine reads such information and automatically punches it into any number of successive cards which follow.

The Type 514 Reproducing Punch (see Fig. 1-B) combines the features of reproducing, gang punching and comparing, in one machine. Reproducing is the punched card counterpart of copying information which changes for each item copied. Information from one deck of prepunched cards is automatically punched into another deck of cards. In this case the two decks of cards are fed through the machine in synchronism. Gang punching is the automatic copying of punched information from a master card into one or more detail cards following it. This function corresponds to repetitive copying. Reproducing and gang punching may be accomplished simultaneously; that is, while information is being reproduced into a group of cards, additional data may be gang punched from a pre-punched master card.

The Electronic Calculating Unit is a combination of two separate machines, a Type 521 Summary Punch and Type 605 Electronic Calculator (see Fig. 1-C-D). This calculating unit will add, subtract, multiply, and divide data in punched cards, recording the results in the same cards at the rate of 6000 cards per hour. Any of these arithmetical operations can be combined.

Several independent problems may be performed and the results punched in the card in the same operation. This unit has the ability to recognize the holes in standard punched cards as numbers.

The Type 82 Punched Card Sorting Machine (see Fig. 1-E) groups all cards of similar classification punched in them and at the same time arranges such classifications in numerical sequence. The sorting operation is accomplished at the rate of 650 cards per minute, per column sorted.

The Type 77 Punched Card Collator (see Fig. 1-F) performs somewhat more complicated rearrangements of cards than the Sorter. The machine has two feed and four output pockets. It may be used for merging two decks of punched cards into one deck of given sequence. Both decks of cards must be in the same proper sequence before they are merged.

The Card-Programming Electronic Calculator — Model 2 (CPC) is a general purpose, medium power computer, which has been designed to perform any predetermined sequence of arithmetic operations. It will perform any prescribed sequence of instructions on standard IBM punched cards. It will also select and follow one of several sequences of instructions as a result of operations already performed. The input to the CPC consists of numerical data and coded instructions in the form of standard IBM punched cards. The output consists of either intermediate or final results which may be punched in cards, or printed, or both.

Basically, the CPC consists of four individual units interconnected by cables. These units are (1) the Type 412 Accounting Machine (also known as a card reader and printer), (2) the Electronic Calculating Unit composed of the Type 605 Electronic Calculator and the Type 521 Summary Punch, both of which were previously mentioned, and (3) the 941 Supplemental Storage Units (see Fig. 1-G-C-D-H).

The nerve centers of most of these machines are plug type control panels which cause them to perform the required operations by interconnecting their internal circuits.

Since detailed accounts of machine internal components are available in the literature,[2] it will not be necessary to cover this phase of the matter here.

## Previous Method

The previous method used in the solution of the street luminaire problem was one of manual data transcription and reduction. The data were taken by means of equipment which has already been described in the literature.[3] The reduction of the data was accomplished by a method which is probably about three per cent more accurate than that described in the I.E.S. Guides to Testing Procedures.[4] This previous method is described briefly as follows:

> The data were transcribed manually on a data form, the 880 photometer readings in the center of the 10-degree square zones for equal and opposite horizontal angles being paired for averaging. A "trial balance" was made by adding each vertical column of readings corresponding to vertical angles ending in the numeral "5," the proper zonal constants applied to each column, the resulting "relative lumens" summed, this sum multiplied by the candlepower factor for the photometer and the total efficiency for the luminaire determined. This calculated efficiency is compared with the efficiency as measured in a photometric integrator[3] and if a check within plus or minus 1 or 2 per cent is obtained, it is considered safe to proceed with the calculations.
>
> Corresponding right and left photometric readings are then averaged. The photometer calibration factor is then applied to each average reading to obtain the candlepower readings in the center of each of the 10-degree square zones. The lumens for each 10-degree square zone are obtained by application of the proper zonal constants to 300 of the average candlepower values. These lumens are then summed to give total luminaire efficiency, and percentage of bare lamp in lower and upper street and house sides. Points for plotting the utilization efficiency curves are then obtained by application of the proper constants to the 300 zonal lumen values.
>
> To obtain the iso-footcandle diagram, it is first necessary to calculate vertical planes of footcandles by applying the proper constants to all of the 440 average candlepower values.
>
> The finished report appears in Fig. 2.

## Digital Computer Method

The source data consisting of the photometer readings and which are the same as mentioned in the previous method, except in convenient form for key punching are punched using the Type 31 Machine into manila cards.

Since there are 440 pairs of left and right photometer readings for this particular problem, this same number of manila cards is used. The deck thus formed is called the problem deck.

At this juncture, a pre-punched master deck of cards which contains the constants and coding common to several of the cards of the problem deck is introduced.

Using the Type 82 Sorting Machine, all the cards in the master deck having the same values of vertical angles as in the problem deck are selected.

Using the Type 415 Reproducing Machine, the following information is reproduced from the master deck into the problem deck:

Consecutive card numbers, lumen constants, CPC coding, and footcandle constants.

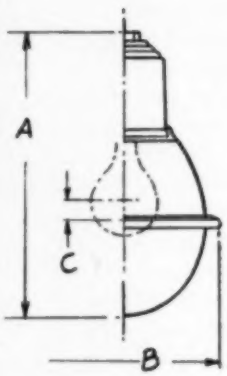
Using this same machine the candlepower multiplier from another card, which information is common to all the cards in the problem deck, is gang punched into this deck.

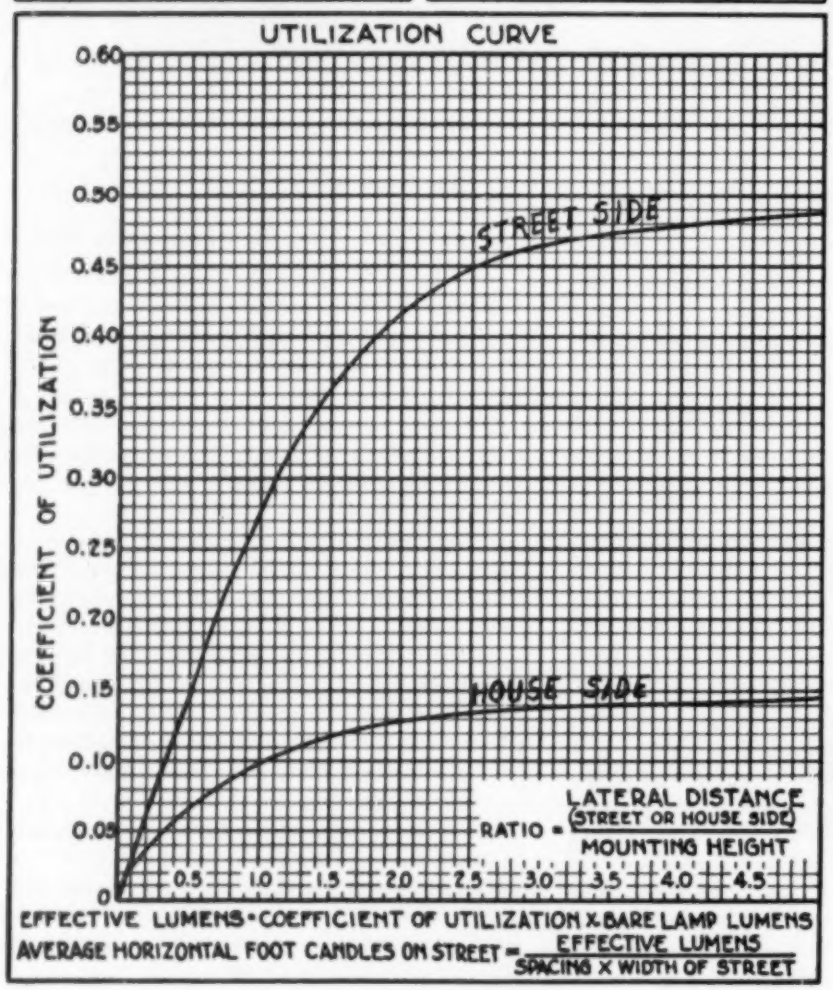
The problem deck is run through the Type 605-521 Electronic Calculating Unit which has a specially wired control panel for this problem. This

## PHOTOMETRIC DATA

| LAMP DATA | |
|---|---|
| SERVICE | STREET SERIES |
| LUMENS, BARE LAMP | 10,000 |
| AMPS. | 20 |
| WATTS | |
| VOLTS | |
| BULB | PS-40 CLEAR |
| BASE | MOGUL SCREW |
| FILAMENT | C-7 |
| FILAMENT LENGTH | |
| FILAMENT WIDTH | |
| LIGHT CENTER LENGTH | 7 in |
| BURNING POSITION | BASE UP |

| LIGHT FLUX VALUES | LUMENS | PERCENT OF LAMP |
|---|---|---|
| DOWNWARD STREET SIDE | 4911 | 49.1 |
| UPWARD STREET SIDE | 94 | 0.9 |
| DOWNWARD HOUSE SIDE | 1481 | 14.8 |
| UPWARD HOUSE SIDE | 75 | .8 |
| TOTAL | 6561 | 65.6 |




| | |
|---|---|
| A | 23½ in |
| B | 15 in |
| C | 1 in |
| D | |
| E | |
| F | |
| G | |
| | |

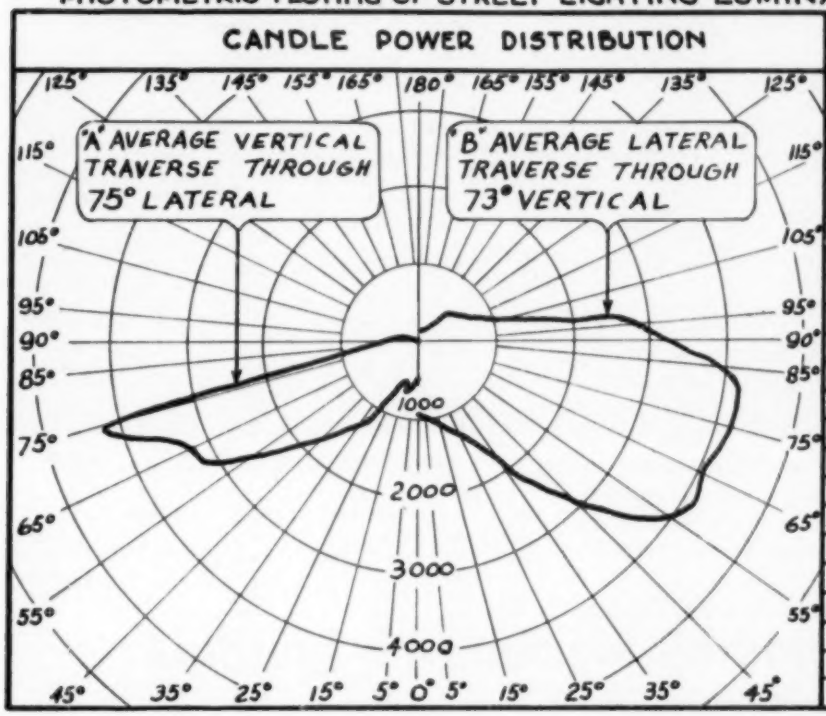
TEST DISTANCE — 25 FT.
REFLECTOR — FLUTED SPECULAR ALZAK ALUMINUM

TEST CONDITIONS — LAMP STATIONARY PLANE OF LEAD WIRES PARALLEL TO STREET OPEN SIDE OF FILAMENT ON STREET SIDE.

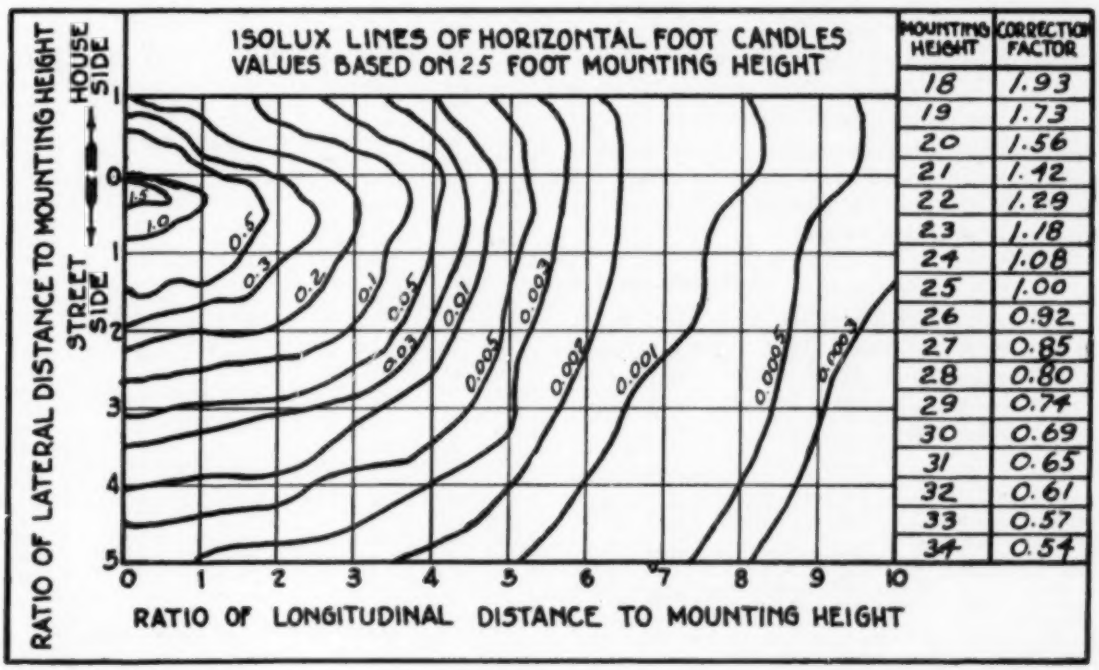
**Figure 2.** (on this and facing page) Photometric report using previous method.

TYPE AK-10 LUMINAIRE
HINGED CONSTRUCTION
TYPE III REFRACTOR
HOUSE SHIELD

TESTED IN ACCORDANCE WITH I.E.S. GUIDE FOR PHOTOMETRIC TESTING OF STREET LIGHTING LUMINAIRES.


CANDLE POWER DISTRIBUTION
"A" AVERAGE VERTICAL TRAVERSE THROUGH 75° LATERAL
"B" AVERAGE LATERAL TRAVERSE THROUGH 73° VERTICAL
125° 135° 145° 155° 165° 180° 165° 155° 145° 135° 125°
115° 105° 95° 90° 85° 75° 65° 55°
1000
2000
3000
4000
45° 35° 25° 15° 5° 0° 5° 15° 25° 35° 45°

| ANGLE | CANDLE POWER A | CANDLE POWER B |
|---|---|---|
| 180° | | 213 |
| 175° | | 220 |
| 165° | | 233 |
| 155° | 0 | 266 |
| 145° | 13 | 373 |
| 135° | 27 | 519 |
| 125° | 27 | 652 |
| 115° | 40 | 706 |
| 105° | 53 | 932 |
| 95° | 80 | 2596 |
| 90° | 107 | 3156 |
| 85° | 213 | 3874 |
| 75 | 3022 | 4181 |
| 73 | 4181 | — |
| 65° | 3102 | 4048 |
| 55° | 2463 | 3914 |
| 45° | 1877 | 2982 |
| 35° | 1451 | 1957 |
| 25° | 892 | 1345 |
| 15° | 692 | 1025 |
| 5° | 746 | 985 |
| 0° | 506 | 972 |




| MOUNTING HEIGHT | CORRECTION FACTOR |
|---|---|
| 18 | 1.93 |
| 19 | 1.73 |
| 20 | 1.56 |
| 21 | 1.42 |
| 22 | 1.29 |
| 23 | 1.18 |
| 24 | 1.08 |
| 25 | 1.00 |
| 26 | 0.92 |
| 27 | 0.85 |
| 28 | 0.80 |
| 29 | 0.74 |
| 30 | 0.69 |
| 31 | 0.65 |
| 32 | 0.61 |
| 33 | 0.57 |
| 34 | 0.54 |

run calculates from the information punched on each card as above, the candlepower, lumens, and footcandles, and punches these values on the corresponding cards.

The problem deck is then run through the Type 412 Accounting Machine where the answers are listed on 8 x 10 perforated forms as in Fig. 3.

The problem deck is then sorted on a column which separates from it all the cards having Horizontal and Vertical angles ending in "5," or cards with lumen values punched in them.

The CPC receives its instructions from a prepunched operational deck of cards. These cards are merged using the Type 77 Collator to the consecutive numbers on each card, with the shortened problem deck mentioned in the preceding paragraph.

The combined decks are run through the CPC which sums the lumens by quadrants, converts the lumens to effective lumens for the six given ratios of mounting height to transverse distances on the street surface, sums these effective lumens according to street-side and house-side, computes the utilization efficiencies for each of these summations (thus giving six points each on the utilization efficeney curves), and finally gives the total efficiency of the luminaire.

The complete listing of answers is illustrated by Fig. 3, twelve such pages being required for complete information.

The above computer operations consume a little over one hour time, whereas 15 to 20 man-hours were required to produce the same results by a technician using a desk type calculator.

Other suggested applications of the computers are their use as linear interpolators to find points on isocandle and isofootcandle curves and the computation of illumination from luminaires applied in a tilted position but photometrically tested n the normal mounting position.


## Acknowledgments

Many thanks are due to Dr. E. L. Harder, Dr. B. H. Mount, and Messrs. P. A. Zaphyr and Mr. Middletown without whose excellent cooperation and efforts the production of this article would have been impossible.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LUMINAIRE
TEST NO K183462

| | |
|---|---|
| 2SUM SS LUM D05 | 1454.91 |
| 2SUM SS LUM D10 | 2746.55 |
| 2SUM SS LUM D20 | 4174.65 |
| 2SUM SS LUM D30 | 4639.41 |
| 2SUM SS LUM D40 | 4785.73 |
| 2SUM SS LUM D50 | 4840.97 |
| 2SUM HS LUM D05 | 668.11 |
| 2SUM HS LUM D10 | 1001.03 |
| 2SUM HS LUM D20 | 1285.85 |
| 2SUM HS LUM D30 | 1377.25 |
| 2SUM HS LUM D40 | 1417.01 |
| 2SUM HS LUM D50 | 1435.31 |
| UTIL COEF SS D05 | 14.54 |
| UTIL COEF SS D10 | 27.46 |
| UTIL COEF SS D20 | 41.74 |
| UTIL COEF SS D30 | 46.39 |
| UTIL COEF SS D40 | 47.85 |
| UTIL COEF SS D50 | 48.40 |
| UTIL COEF HS D05 | 6.68 |
| UTIL COEF HS D10 | 10.01 |
| UTIL COEF HS D20 | 12.85 |
| UTIL COEF HS D30 | 13.77 |
| UTIL COEF HS D40 | 14.17 |
| UTIL COEF HS D50 | 14.36 |
| 2SUM LUM QUAD 1 | 4911.09 |
| 2SUM LUM QUAD 2 | 1480.87 |
| 2SUM LUM QUAD 3 | 94.01 |
| 2SUM LUM QUAD 4 | 74.49 |
| 2TOTAL SUM LUM | 6560.46 |
| EFFICIENCY | 65.60 |

| ANGLES H | ANGLES V | PHOTR READINGS | | C.P. | LUMENS | F.C. |
|---|---|---|---|---|---|---|
| 000 | 000 | 40 | 40 | 533. | | .852800 |
| 005 | 000 | 40 | 40 | 533. | | .852800 |
| 015 | 000 | 40 | 40 | 533. | | .852800 |
| 025 | 000 | 40 | 40 | 533. | | .852800 |
| 035 | 000 | 40 | 40 | 533. | | .852800 |
| 045 | 000 | 40 | 40 | 533. | | .852800 |
| 055 | 000 | 40 | 40 | 533. | | .852800 |
| 065 | 000 | 40 | 40 | 533. | | .852800 |
| 075 | 000 | 40 | 40 | 533. | | .852800 |
| 085 | 000 | 40 | 40 | 533. | | .852800 |
| 090 | 000 | 40 | 40 | 533. | | .852800 |
| 095 | 000 | 40 | 40 | 533. | | .852800 |
| 105 | 000 | 40 | 40 | 533. | | .852800 |
| 115 | 000 | 40 | 40 | 533. | | .852800 |
| 125 | 000 | 40 | 40 | 533. | | .852800 |
| 135 | 000 | 40 | 40 | 533. | | .852800 |
| 145 | 000 | 40 | 40 | 533. | | .852800 |
| 155 | 000 | 40 | 40 | 533. | | .852800 |
| 165 | 000 | 40 | 40 | 533. | | .852800 |
| 175 | 000 | 40 | 40 | 533. | | .852800 |
| 180 | 000 | 40 | 40 | 533. | | .852800 |
| 000 | 005 | 79 | 79 | 1052. | | 1.664022 |
| 005 | 005 | 78 | 80 | 1052. | 2.74 | 1.664022 |
| 015 | 005 | 77 | 79 | 1039. | 2.70 | 1.643459 |
| 025 | 005 | 75 | 77 | 1012. | 2.63 | 1.600751 |
| 035 | 005 | 72 | 74 | 972. | 2.53 | 1.537480 |
| 045 | 005 | 70 | 70 | 932. | 2.42 | 1.474210 |
| 055 | 005 | 66 | 64 | 865. | 2.25 | 1.368231 |
| 065 | 005 | 63 | 63 | 839. | 2.18 | 1.327105 |
| 075 | 005 | 60 | 61 | 806. | 2.10 | 1.274907 |
| 085 | 005 | 57 | 58 | 766. | 1.99 | 1.211636 |
| 090 | 005 | 56 | 57 | 752. | | 1.189491 |
| 095 | 005 | 55 | 56 | 739. | 1.92 | 1.168928 |
| 105 | 005 | 55 | 55 | 732. | 1.90 | 1.157856 |
| 115 | 005 | 54 | 54 | 719. | 1.87 | 1.137293 |
| 125 | 005 | 54 | 54 | 719. | 1.87 | 1.137293 |
| 135 | 005 | 54 | 55 | 726. | 1.89 | 1.148365 |
| 145 | 005 | 54 | 55 | 726. | 1.89 | 1.148365 |
| 155 | 005 | 55 | 55 | 732. | 1.90 | 1.157856 |
| 165 | 005 | 57 | 57 | 759. | 1.97 | 1.200563 |
| 175 | 005 | 57 | 57 | 759. | 1.97 | 1.200563 |
| 180 | 005 | 57 | 57 | 759. | | 1.200563 |

**Figure 3. Sample of listing of answers using IBM machines.**

INSTALLATION AT SCHAEFFER ROAD AND MICHIGAN AVENUE, DEARBORN, MICHIGAN.

# Lighting a Municipal Parking Lot

**LIGHTING OBJECTIVE:** To provide sufficient illumination for motorists to walk through the area safely, locate their automobiles, and operate the parking meters.

**GENERAL INFORMATION:** The size of this city-owned parking lot is indicated in Fig. 2. The capacity of the area is 832 automobiles.

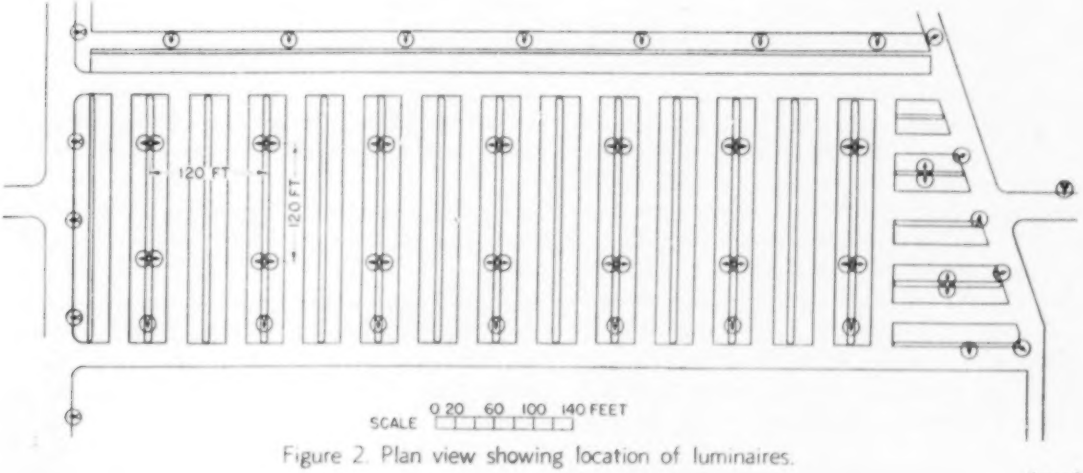


Figure 2. Plan view showing location of luminaires.

(over)

A.I.A. File No. 31

Figure 3. (right) Close-up of luminaire.

**INSTALLATION:** Westinghouse Type AK-10 luminaires (style 1565184 with Alzak reflector, deflector and deep clear rippled glassware), I.E.S. Type IV distribution with 10,000-lumen 20-ampere series incandescent filament lamps, are mounted approximately 25 feet above the pavement. The bracket arms are 18 feet long. Average horizontal illumination in service (measured in accordance with I.E.S. Guide for Outdoor Illumination Tests) is 0.87 footcandle.

**Lighting data submitted by George K. Glass, The Detroit Edison Company, Detroit, Michigan, as an illustration of good lighting practice and to aid in the design of similar installations.**

**Published by the Committee on Publications of the Illuminating Engineering Society 1860 Broadway, New York 23, N. Y.**

# Questions and Answers on light sources

**The I.E.S. Committee on Light Sources, under the Chairmanship of H. F. Davidson, has prepared this discussion as an answer to questions concerning the operation of fluorescent lamps under low-temperature conditions. Readers are invited by the Committee to submit similar questions on light sources to be considered for publication. Questions should be sent to Society Headquarters.**

## Low Temperature Operation of Fluorescent Lamps

The three problems generally associated with operating fluorescent lamps at low temperature are (1) decreased starting reliability, (2) possible damage to auxiliary equipment caused by (a) freezing of the capacitor dielectric or (b) weathering of lead wires and components when used outdoors, and (3) reduced light output of the lamps. *Starting Reliability and Ballast Damage* — Fluorescent lamp starting becomes progressively more difficult as the temperature decreases. Several factors affect starting reliability at low temperatures. These include the type of ballast, type of starter (when used), line voltage, humidity, grounding of circuits and metal fixtures, and the normal manufacturing variations in lamps and ballasts. The following principles guide the selection of lamp and accessory combinations for satisfactory low-temperature operation.

1. The circuit voltage should be in the upper half of the ballast voltage rating. For 110-125 volt ballasts, this means 118 volts or more.

2. Ballasts with liquid-dielectric capacitors (two-lamp lead-lag and single-lamp high power factor ballasts) should not be used below 32F, unless the capacitors are made with low-temperature dielectric.

3. Normal combinations of fluorescent lamps, ballasts and starters will give reliable starting down to 50F.

4. Certain combinations of fluorescent lamps and starters permit operation at lower temperatures at rated line voltage with single-lamp or lead-lag ballasts, and are recommended for the temperature limits indicated:

(a) *Down to zero degrees:* Use 15-, 20-, 30-, or 40-watt lamps with thermal-switch starters, or 40-watt low-temperature lamps with glow-switch starters, or 100-watt lamps with thermal or glow-switch starters, or 72T8, 72T12, 96T8, or 96T12 slimline lamps.

(b) *Down to 20F:* Any of the above combinations, or 40-watt instant-start lamps, or 48T12 slimline lamps on ballasts designed for this service.

(c) *Down to 32F:* Any of the above combinations, or 14-, 15-, 20-, 30-, or 40-watt lamps with glow-switch starters, or 40-watt Rapid Start lamps, or 42T6 or 64T6 slimline lamps, or 22- and 32-watt circline on preheat-start ballasts.

5. Do not use instant-start series-sequence or trigger-start ballasts if the ambient temperature is below 50F.

Special ballasts for operation of 40-watt instant-start, slimline, and certain circline lamps are available which give reliable starting down to zero degrees. These ballasts have capacitors with low-temperature dielectric, and weatherproof lead wires. In some cases, such ballasts have been designed to deliver the higher open-circuit voltages needed for reliable starting under these cold conditions. The low-temperature capacitors withstand freezing down to −20F, but this should not be interpreted to mean reliable starting at this temperature. The 100-watt T-12 Rapid-Start street-lighting lamp will start down to −20 to −30F on ballasts designed for this service.

In cases of doubt about satisfactory operation at low temperatures, it is recommended that information on the specific lamp and accessory combina-

tions contemplated be obtained from the lamp and ballast manufacturers.

*Light Output* — The lumen-output ratings of fluorescent lamps are based on bare operation in still air at 80F. The most common sizes of lamps are at or near maximum light output under these conditions, but generate less light for higher or lower surrounding air temperatures. For example, the familiar 40-watt T-12 lamp produces about 80 per cent as much light when exposed in still air at 40F or 120F as at 80F. If the ambient temperature is zero degrees, the light output is around 20 per cent of the rated value. Certain of the higher current density lamps (like the 100-watt T-17, T-8 slimlines at 300ma, and the 100-watt T-12 Rapid Start lamp) have maximum output at considerably lower temperatures, and are often considered when low ambients are involved. Because of extreme reduction in light output, exposed 25-, 85-, and 90-watt lamps are usually not considered for operation at temperatures below 50F.

The following tabulation of medium and high current density lamps indicates combinations which will give at least 25 per cent of full luminaire output and reliable starting down to zero degrees F. Of course, the light output at low ambients depends on the degree to which lamps are confined, number of lamps in the fixture, and the actual surrounding air temperature.

1. *Medium current density lamps.*

All T8 slimlines at 200 ma on their own ballasts.

24T12 and 36T12 slimlines on 425-ma lead-lag ballasts for 48T12 slimline.

48T12 slimline on 425-ma lead-lag ballasts for 72T12 slimline.

72T12 and 96T12 slimlines on 425-ma single-lamp or lead-lag ballasts for the 96T12.

32-watt circline on the new outdoor trigger-start ballast.

40-watt low-temperature lamps with glow-switch starters.

40-watt instant start on lead-lag ballasts for the 72T12.

40-watt circline on the new outdoor Rapid Start ballast.

2. *High current density lamps*—highest light output at low temperatures.

42T6 and 64T6 slimlines on the new 200- and 300-ma low-temperature ballasts.

T8 slimlines at 300 ma on their own ballasts.

100-watt preheat with either glow-switch or thermal (preferably thermal) starters.

100-watt T12 Rapid Start on its own ballast.

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## Two-Way Lighting for A Two-Level Roadway

**The lower level roadway, southbound, of the Alaskan Way Viaduct, in Seattle, uses fluorescent lighting, while on the upper deck 400-watt E-H1 mercury vapor lamps of 21,000 lumens provide one footcandle illumination. Lamps are mounted on 28½-foot steel poles with 4-foot brackets, alternately at intervals of 120 feet. Photo courtesy of Pacific Car and Foundry Co. (Carco), Renton, Wash.**

T E L E C A S T
LIGHTING NEWS OF CURRENT INTEREST

# Inter-Mountain Region Holds First Regional Conference in Denver

The Society's youngest Region—Inter-Mountain — officially attained its majority this Spring, in conducting what has been described as one of the best Regional Conferences of them all. Established less than two years ago, the Inter-Mountain Region held its first Regional Conference at the Brown Palace Hotel in Denver, Colorado, April 15 and 16. Everything about it was so excellent, the Conference Committee and others responsible could well have been old hands at conference planning. Attendance was 150, with all Sections and Chapters of the Region represented.

### Technical Sessions

Very important speakers were attracted to this conference, by either the persuasiveness of the Program Chairman, or the fame of Colorado's climate in springtime. Either way, the results were exceptionally interesting technical sessions, complete details of which are listed later in this report. Presiding chairmen at each of the three technical sessions were chairmen of the Region's Chapters.

Opening remarks were made by Harold T. Rankin, Public Service Company of Colorado, Chairman of the Conference and former Regional Vice-President; Address of Welcome was by the Honorable Quigg Newton, Mayor of Denver, with a response by G. B. Buck II, Regional Vice-President.

President A. Homer Manwaring was the speaker at a joint luncheon meeting held with members of the Colorado Engineering Societies. His subject was "Architecture and Engineering in Lighting Design." Mr. Manwaring's address, as well as several others on the program, attracted considerable space in the Denver press.

### Social Program

Typical of western hospitality was an informal reception at the home of Mr. and Mrs. Buck, attended by the entire delegation, held the last afternoon of the conference. The Bucks' home, high on the outskirts of Denver, overlooks the city and 300 miles of mountain range. In addition to the informal get-together, the delegates had an opportunity to view the Bucks' fabulous residence lighting installation, which includes a luminous ceiling throughout the living room, hall and kitchen, and almost every home lighting practice known to the profession.

A banquet honoring President and Mrs. Manwaring followed a reception and cocktail party, Thursday evening, at which H. T. Rankin served as host. A feature of the entertainment during the banquet was a show "From Flame to Fluorescent" put on by J. C. Forbes, Director of the Lighting Institute, General Electric Company, Nela Park, Cleveland, Ohio. Art Weers, Chairman of the Rocky Mountain Section presented to Mr. Man-

**Banquet at the Inter-Mountain Conference. At left at the head table are: l. to r. Arthur Weers, Rocky Mountain Section Chairman; Mrs. Weers; G. B. Buck, Regional V-P; Mrs. Buck; J. C. Forbes, speaker of the evening; H. T. Rankin, Conference Chairman; Mrs. Rankin; A. H. Manwaring, I.E.S. President; Mrs. Manwaring; and Dean Ford.**

**Feature speaker at the Banquet was J. C. Forbes, Director of the Nela Park Lighting Institute. His topic: From Flame to Fluorescent.**

waring a very fancy cowboy shirt, gift from the host Section.

The ladies attending the conference, in addition to participating in the above, were guests of the Region at a luncheon, bridge and canasta party Thursday afternoon, at the Denver Athletic Club. Committee members were also available to assist in side trips to the many famous and scenic sites in and around Denver.

### Lighting Contest

Rocky Mountain Section will represent the Region at the National Conference in Atlantic City next month. Two of the Region's five Chapters participated in the contest, with the following result:

First Prize — Lyle M. Bailey, Rocky Mountain Section.

Second Prize — J. Richard Williams, Arizona Chapter.

### Papers Program

Details of the excellent papers presented at the Denver conference are:

**President Manwaring shows off the cowboy shirt, which was a gift from the Rocky Mountain Section. Mrs. Manwaring and Dean Ford look on.**

**Thursday Morning, April 15**

Opening Remarks — Harold T. Rankin, Public Service Co. of Colorado; Chairman, Inter-Mountain Regional Conference.

Welcome to Denver — Honorable Quigg Newton, Mayor, City of Denver.

Response — G. B. Buck II, General Electric Co.; Regional Vice-President, Inter-Mountain Region.

**Technical Session No. I**

Carl Balsick — *Chairman*

(Chairman, Southern Colorado Chapter)

Lighting in Three Dimensions — A. F. Weers, Weers Electric Planning Service.

Quantity in Lighting — Edward S. Goldman, The Central Electric Supply Company.

Quality in Lighting — A. D. Swanson, Swanson-Rink and Associates.

Color in Lighting — G. B. Buck II, General Electric Company.

**Luncheon** (Members of Colorado Engineering Societies Invited)

A. F. Weers — *Host*

(Chairman, Rocky Mountain Section)

Architecture and Engineering in Lighting Design — A. H. Manwaring, President, Illuminating Engineering Society.

**Technical Session No. II**

Carl Albach — *Chairman*

(Chairman, New Mexico Chapter)

Mine Railway and Storage Yard Lighting. Paper by Utah Chapter.

Street Lighting and Night Traffic Accidents — David M. Baldwin, Director, Traffic Division, National Safety Council, Chicago, Ill.

Uni-Ballast System in Street Lighting — Stacy Standley, Jr., Manager of Street and Airport Lighting, Line Material Co., Milwaukee, Wis.

Denver Street Lighting with Discussion Period —Charles O. Woodworth, Public Service Company of Colorado.
Lester J. Weber, Public Service Company of Colorado.

Problems in Lighting a Steel Mill — C. D. Bell, Southern Colorado Power Company.

**Thursday Evening**

President's Reception and Cocktail Party.

President's Banquet
H. T. Rankin, Chairman, Regional Conference, Host.

"From Flame to Fluorescent" — J. C. Forbes, Director of Lighting Institute, General Electric Company, Cleveland, Ohio.

**Friday Morning, April 16**
**Technical Session No. III**

T. Dale Brown — *Chairman*

(Chairman, Utah Chapter)

3-D Photography in Lighting Sales — Willard Allphin, Sylvania Electric Products, Salem, Mass.

Light and Color in the Home — E. W. Commery, General Electric Co., Cleveland, Ohio.

Class Room Lighting — Paul Atchison, Architect, Denver, Colorado.

Commercial Dining Room Accent Lighting — W. A. Chauvin, Albuquerque, New Mexico.

**Luncheon**

S. L. Burnham — *Chairman*

(Chairman, Arizona Chapter)

"Light's Diamond Jubilee — What More Can Light Do?" Dr. Samuel G. Hibben, Chairman, Diamond Jubilee Task Committee, Illuminating Engineering Society.

**Friday Afternoon**

Planned Field Trips.

Informal Reception.

**First place award, in the Inter-Mountain Regional contest for MMILJ, presented to L. M. Bailey of Denver by I.E.S. President A. H. Manwaring.**

### Credit Due

The Regional Vice-President, G. B. Buck II (himself also a factor in the success of the conference) says orchids are particularly in order for Harold Rankin, General Chairman, Glen Gaer, Program Chairman and Al McKittrick, Arrangements Chairman, for exceptionally well done jobs. All concerned also list the following as in line for great credit:

Conference Vice-Chairman—F. Bischofberger.

Rocky Mountain Section officers—A. F. Weers, Carl Strain and C. O. Woodworth.

Financial and Prizes—C. O. Woodworth.

Attendance—James Humphrey.

Publicity—James Walton.

Reception and Registration—Joe E. Ray.

Lighting Contest—Dean Ford.

Ladies Arrangements—Mrs. Laverne Florance.

Arizona Chapter—S. L. Burnham, Chairman.

New Mexico Chapter—Carl R. Albach, Chairman.

Rocky Mountain Section—A. F. Weers, Chairman.

Southern Colorado Chapter — C. F. Balsick, Chairman.

Utah Chapter—Dale Brown, Chairman.

**Regional V-P G. B. Buck II addressing one of the sessions.**

**Panel-type technical sessions held unusual interest. At the session on Light Sources for 1954 Lighting, Marshall Waterman, I.E.S. General Secretary, (standing) was the principal speaker and the panel was made up of Joe Szursen, Blair Plowman, Elizabeth Ayer and Walter E. Potter.**

## New Approach to Conference Planning Feature of Pacific Northwest Conference

The Pacific Northwest Regional Conference in Seattle departed from the usual pattern of conference programs in the 2½-day meeting held there April 22-24, at the Benjamin Franklin Hotel. With the theme of "Techniques and Tools for Lighting," format for the entire program was a series of five panels, each preceded by a major paper by featured speakers, followed by a panel of four discussion leaders, prepared in advance with 5-minute discussions. Panel members were carefully selected experts of the subject under discussion, their selection being by nomination of their Section or Chapter. In addition to the supplementary comments of the four discussors, each panel session answered questions collected in a question box. Since such answers were of course, quite extemporaneous, some very lively discussion developed including a few off-the-cuff opinions which could even be described as "bombshells." The program procedure, in any case, provided a very stimulating conference of especial value to the interested audience.

### Panel Session No. 1

The first panel session opening day covered the subject "Quality and Quantity Objectives," with the major paper on this subject presented by Willard Allphin of Sylvania Electric Products Inc., Salem, Mass. Chairman was Ray Adam of the Puget Sound Section. Panel Moderator was Walter S. Gordon, Consulting Engineer of Tacoma, Wash., who led discussion leaders as follows:

1. Commercial and Store Lighting—Coe C. White Jr., Consulting Engineer, Portland, Ore.
2. School and Office Lighting — J. R. Walker, Provincial Government of British Columbia, Vancouver, B. C.
3. Environment and Home Lighting — Dr. H. C. Hall, Optometrist, Seattle, Wash.
4. Industrial Lighting—Marshall Waterman, Westinghouse Electric Co., Bloomfield, N. J.

### Panel Session No. 2

The next panel dealt with the main subject of "Light Sources for 1954," featured speaker being Marshall Waterman. Chairman was Frank M. Reis of Oregon Section; Moderator of the Panel was Donald W. Edmundson, Portland, Oregon. Discussion leaders and their subjects:

1. Store Lighting—Joe Sjursen, Frederick & Nelson, Seattle, Wash.
2. School Lighting—Prof. Richard Harbour, Washington State College, Pullman, Wash.
3. Environment and Home Lighting — Elizabeth Ayer, Architect, Seattle, Wash.
4. Industrial Lighting—Walter E. Potter, General Electric Company, Portland, Ore.

### Panel Session No. 3

"The Lighting Safety Relationship" came under discussion at the opening session April 24, with Percy Fletcher, Victoria Chapter, serving as Chairman. Major paper on the subject was by David M. Baldwin, Director of the Traffic Division of the National Safety Council, Chicago. With Kenneth Reid, City of Victoria, as Moderator, the following panel discussed aspects of the main subject:

1. Street Lighting — Stacy Standley, Line Material Company, Milwaukee, Wis.
2. Outdoor Lighting—Dave Mozes, General Electric Supply Co., Spokane, Wash.
3. Street Lighting—Carl Lundell, City of Portland, Portland, Oregon.
4. Industrial Lighting — Henry Haber, Benjamin Electric Mfg. Co., Seattle, Wash.

### Panel Session No. 4

On the afternoon session, under the chairmanship of Dave Mozes of Inland Empire Chapter, major paper by Wentworth M. Potter, General Electric Co., Nela Park, Cleveland, covered "Some Facets of Illumination Design." Discussion leaders, with John Rufatto, Columbia Electric & Mfg. Co., Spokane, as Moderator, discussed design as related to:

(1) Commercial and store lighting, (2) School and office lighting, (3) Environmental and home lighting, and (4) Industrial lighting. In this order, they were:

Percy Fletcher, Canadian General Electric Co., Victoria, B. C.
Joseph F. Doyle, Consulting Engineer, Spokane, Wash.
Paul Thiry, Architect, Seattle, Wash.
Leonard Hobbs, Smoot-Holman Co., Inglewood, Calif.

### Panel Session No. 5

Leonard Hobbs delivered the major paper for the final session, covering the subject "Luminaire Development for 1954 Lighting." Breaking this down into commercial, school, and industrial lighting were:

D. S. Gordon, British Columbia Electric Railway Co., Ltd., Vancouver, B. C.
Willard Allphin, Sylvania Electric Products Inc., Salem, Mass.
Wentworth M. Potter, General Electric Company, Nela Park, Cleveland, Ohio.

Consensus of all those attending was that the panel-discussion type of program definitely elevated the plane of the conference and stimulated attendance at every session, which ran close to 100 per cent of those registered, throughout the conference. (Registration totalled 189.)

The "take home" benefit of the average listener was increased at this conference, it was felt, by the concentration

**Head table and a few of the members and guests attending the Banquet at the Pacific Northwest Regional Conference.**

on a single broad basic topic, and the avoidance of sessions grouping unrelated specific papers. Probably the most valuable aspect of the programming was the open discussion, not normally experienced at sessions featuring widely diversified subject matter.

An additional advantage to I.E.S. was felt to be the interest taken in the conference by other groups, including many architects, optometrists, and consulting engineers.

### Special Events

Two distinguished speakers were featured at the banquet, held the evening of the first day. With Beverly A. Travis of Seattle serving as M.C., the 175 members and guests attending this affair heard I.E.S. President A. H. Manwaring's address, and S. G. Hibben (Past President) who spoke on "Light's Diamond Jubilee." Entertainment and dancing followed.

Mr. Manwaring also addressed a luncheon meeting, April 23, held jointly with the Seattle Chamber of Commerce.

In addition to the banquet, a cocktail party for the entire delegation was held the following afternoon, with the compliments of Puget Sound Section. This continued to hold the group together and cemented friendships made at the party the previous night.

A Regional Activities Meeting was held at the conference hotel the day before the conference, with W. J. Lind, Regional Vice-President, presiding. Actually this meeting was a very valuable indoctrination course for incoming officers, of whom 22 were present.

The attendance trophy, the "Regional Vice-President's Shield" was won by the Vancouver Island group attending the conference. This is an annual award to the Chapter or Section within the Region attaining the highest average membership-attendance at the conference.

### M.M.I.L.J.

Interest in the "My Most Interesting Lighting Job" contest was very keen, with representatives from every Section and Chapter competing at the Regional contest. A Judging Committee headed by Marshall Waterman as Chairman, chose three winners as follows:

First Prize — Eric Ackland — British Columbia Section. Mr. Ackland's installation will represent the Region at the National Technical Conference in Atlantic City next month.

Second Prize — D. E. Seely and K. W. Moore — Oregon Section.

Third Prize — Percy Fletcher — Vancouver Island Chapter.

Installations which had won first prize in their Sections were also presented as follows:

Inland Empire Chapter — Ted Beadle
Puget Sound Section — Gerald Fitzmaurice.

### Credit Due

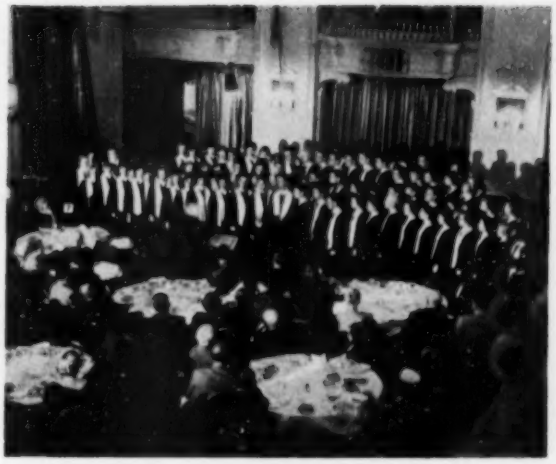
Considerable organization involving many details was required for the panel-type program, involving as it did preconference preparation of all discussors in relation to the major paper, instruction to moderators on procedure, and very careful timing. The genius responsible for all this was H. A. Gardner, Columbia Electric & Mfg. Co., who served as Program Chairman on the Conference Committee. Working hand in glove with him was the Regional Vice-President Walter J. Lind (Vancouver, B. C.), and other members of the Conference Committee. Specific responsibility for the success of this meeting was assumed as follows:

Regional Vice-President—Walter J. Lind
Chairman, Puget Sound Section—R. E. Adam
Conference Chairman—K. E. Hollingsworth
Program Chairman—Harold A. Gardner
Hotel Arrangements and Banquet—Freeman Scharr
Conference Secretary—G. Don King
Conference Treasurer—Don Pearson
Attendance and Publicity—C. A. Scheyer and Art Kramer
Ladies Reception—Mrs. Edith Rauch
Properties—Henry Huber
Introduction of Panel Speakers—C. C. Fields
British Columbia Section—R. W. Racine, Chairman
Inland Empire Chapter—D. C. Mozes, Chairman
Oregon Section—F. M. Reis, Chairman
Puget Sound Section—R. E. Adam, Chairman
Vancouver Island Chapter—P. F. Fletcher, Chairman

**Two Committee Chairmen compare notes: (left) H. A. Gardner, Program Committee, and at right, K. E. Hollingsworth, the Conference Chairman.**

**Photographs of the Pacific Northwest Regional Conference courtesy of *Electrical West*.**

**Vice-President Duncan M. Jones and President A. H. Manwaring greet Louis J. Schrenk, a Fellow of the Society from the Michigan Section.**



**The Grosse Pointe a cappella choir, of high school students, entertained at the Banquet of the Great Lakes Regional Conference.**

## Attendance Tops 300 At Great Lakes Regional Conference

It was apparent to all who attended the Great Lakes Regional Conference in Detroit (May 3-4, Hotel Sheraton-Cadillac) that its planners were experienced, energetic and full of ideas. Future conference committees could well consult them before taking a step.

For one thing, this may have been the first time many I.E.S. members ever saw the tools of their own trade so effectively used in staging a meeting. While the effects are easier to appreciate than describe, principally the illumination principle used was the familiar one of direction of attention, by the proper use of light, for the greatest end result. At all technical sessions, carefully staged lighting directed audience attention precisely where attention was wanted — chairman, speaker, screen, or wherever. The screen was centered on a portable stage, out of sight behind curtains when attention should be elsewhere. Chairman was at a rostrum to one side, speaker on the other. Lights on dimmers, and controlled on cue behind the scenes by a crew of volunteers, directed attention first to the chairman, dimming out on him as he introduced the speaker, and up on the speaker as the audience's attention was required in that direction. As an illustrative slide was mentioned, curtains opened on the screen (again on cue, and very smooth) and on came the projector, down went the dimmer on the speaker himself. Very professional, and worthy of a meeting of this stature. Chiefly responsible for this lighting feature, which in itself made this conference outstanding, was H. Creston Doner, Libby-Owens-Ford Glass Company, Chairman of the Committee on Lighting and Decoration.

No less than the lighting, in the happy results of the staging, was the portable stage equipment, loaned to the Conference Committee by the Lighting Division of the Detroit Edison Company. It was erected and operated by Lighting Division personnel, and was without doubt an outstanding feature much appreciated by the session audiences.

Attendance at these sessions was never less than 200 delegates. Total attendance at all events was 318, with a total official registration of 282, including 68 ladies.

### M.M.I.L.J.

The participants of the contest for "My Most Interesting Lighting Job" also enjoyed the stage equipment and lighting effects, for the presentation of their prize-winning entries. Seven Sections and Chapters of the Region were represented at the contest. Winner was the Michigan Section, which will again represent the Region at the final contest in Atlantic City next month. Entries on the Regional level were:

**First Prize** — Floyd Sell & Duncan Preston, Detroit Edison Co., Michigan Section. "Special Application at Detroit Plating Company."

**Second Prize** — Robert Dorsey and David Pritchard, General Electric Co., Cleveland, Ohio. "Lighting an Auditorium."

**Third Prize — Tie** — Robert M. Taylor, Toledo Edison Co., Northwest Ohio Section. "The Fred Springer Men's Apparel Store." And Harold J. Gruber, Cincinnati Gas and Electric Co., Ohio Valley Section. "Chapel Lighting."

**Runners-up**

James Q. Miller, Consumers Power Co., Western Michigan Chapter. "Relighting Hackley Public Art Gallery."

Harry G. Nolan, Industrial Electric Co., Rochester Section. "Relighting the Monroe County Clerk's Office, Courthouse, Rochester, N. Y."

F. Brendon Burke, Ferguson Electric Construction Co., Western New York Section. "Special Lighting for a Conference Room."

The panel of judges, all from out of the Region were: A. Homer Manwaring, National I.E.S. President; Duncan Jones, President-Elect; Marshall Waterman, General Secretary; C. L. Crouch, I.E.S. Technical Director; T. C. Sargent, Sylvania Electric Products Inc., Salem, Mass.

### Papers Program

Several innovations as to subject were included in the papers program. Of particular interest in this respect was the paper by P. E. Stephens, an advertising man, on "A New Technique of Lighting Education." This excellent presentation was an illustrated discussion of industrial and commercial lighting installations especially adapted for sales use. He included also a series of advertisements showing photographs edited for the purpose of producing inquiries and sales, and pointed up the close relationship of other interests — education and advertising, for instance, with the lighting field.

**Attendance by Sections**

| | |
|---|---|
| Central New York | 12 |
| Cleveland | 31 |
| Michigan | 168 |
| Northwestern Ohio | 16 |
| Ohio Valley | 5 |
| Rochester | 14 |
| Western Michigan | 11 |
| Non Region Members | 21 |

New trends in mercury lighting were discussed by Dana W. Rowten at the opening session. He outlined current application of this source, with cost figures to show why its growth, and a forecast for the future.

Details of one of the widely used systems of glare rating were simplified and explained by R. L. Oetting, in his talk on Visual Comfort Index.

Another paper not usually found on Regional Conference programs, but highly entertaining as well as educational, was the review of 75 years of home lighting, given by Mary Taepke of Detroit Edison. Included in her talk was a dramatic skit, which demonstrated with humor and live actors, advances in this field. The ancient equipment, of course, was priceless.

Copious notes were made by the audience, to retain valuable information, during three other presentations. A. C. Barr, Nela Park, in his paper reviewed the first year's experience with rapid start fluorescent lamps, which now reach the million mark of lamps installed. Ted Sargent of Sylvania outlined some experiences on improving the maintenance of industrial and commercial fluorescent fixtures. Good classroom lighting designs were analyzed particularly with respect to the economics of construction and operation, by H. G. Daverman. The author of this paper challenged the economic value of more daylighting in classrooms, and arrived at the conclusion that electrically lighted classrooms may be as much as 6 per cent less expensive to build and no more expensive to operate and maintain than are classrooms which use big windows, clerestories, skylight, etc., to minimize the need for electrical lighting.

The technical sessions, under the general chairmanship of Alfred C. Sangster of the Michigan Section, were opened with an invocation by the Reverend John Mangrum, Pastor of St. Peter's Episcopal Church, Detroit. Following the M.M.I.L.J. contest (the only Regional to feature this at the opening session) a luncheon was held for all delegates, with George S. Evans as chairman. Featured speaker at this affair was A. Homer Manwaring, I.E.S. President.

**H. Creston Doner, Chairman of the Lighting and Decoration Committee, who was responsible for the design and operation of the staging and lighting effects at technical sessions.**

ENTERTAINMENT

Highlight of the social program was, of course, the Reception and Banquet on the evening of May 3, honoring President and Mrs. Manwaring. This had its own highlights. Pictures taken at the conference unfortunately do not include a shot of the banquet table backdrop, but a description should nevertheless go into the record. The backdrop, and the lighting thereof, was the work of the Committee on Lighting and Decorations, and featured a huge mural effect of the Great Lakes in outline. Each of the cities of the I.E.S. Great Lakes Region was in light in its proper place on this "map." For glitter and beauty, a rotating, metal sphere was spotlighted in various colors, the spotlights being located in the balcony. Included also in the extremely effective decoration was the symbol of Light's Diamond Jubilee in huge gold medallions.

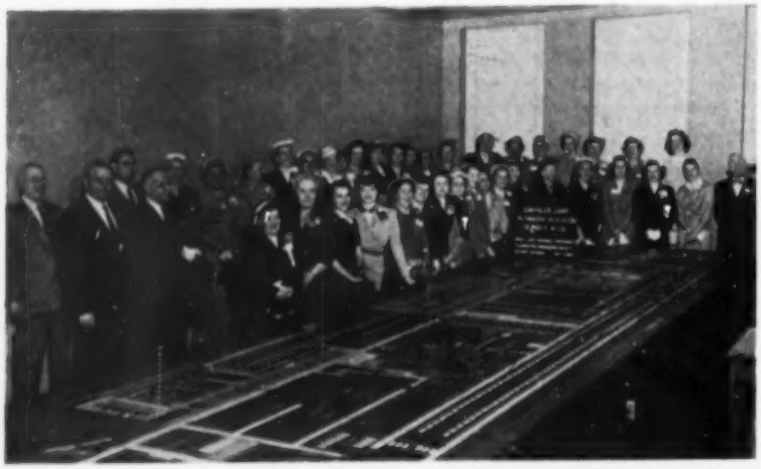
Another highlight of the banquet was the entertainment provided by the Grosse Pointe High School a capella choir, a group of over 100 well-trained young people. Dale Rhodes also entertained the group of 348, as Master of Ceremonies.

During the festivities, Les Twichell, Regional Vice-President presented to the Manwarings a sterling silver punch bowl engraved for the occasion.

After the banquet, and before the dancing, the entire party attended the official lighting of a 75,000-watt lamp outside in front of the hotel, publicly commemorating Light's Diamond Jubilee. The City of Detroit Public Lighting Commission was invited to light this lamp, but due to lack of proper regulating equipment, the job was placed in the hands of the Jack Frost Electric Company. Mr. Frost, a member of I.E.S. provided a huge piece of generating equipment, courtesy of his company, for this impressive ceremony.

While it was the high spot, the banquet was by no means the only item of the social menu. A coffee hour was sched-

*(Continued on page 13A)*



**The entertainment provided for the ladies included a visit to the Plymouth automobile plant in Detroit to watch them making cars.**

**Photos of the Great Lakes Regional Conference are by courtesy of Ernest Cooper, Detroit Edison Company.**

INSTALLATION: North Coventry Township School, Pottstown, Pennsylvania.
DESIGNED BY: Eastern Engineering Co., Reading, Pennsylvania.
AREA: Lower Grade Elementary Classroom 24′ x 30′.
CEILING HEIGHT: Approximately 9′ -6″.
FIXTURES: 15 - Litecontrol No. 9224 surface mounted, using Holophane No. 9100 CONTROLENS*
SPACING: 8′ -0″ on centers.
INTENSITY: On desk top beneath fixtures, 70 footcandles initially. Average over room, 47 footcandles initially.

# *Bright Solution*

## to an old classroom problem

## ...furnished by LITECONTROL

EYES have it easy in this light, attractive classroom. Note the even illumination . . . the absence of glare . . . the ease of seeing . . . all carefully calculated to protect young eyes . . . keep them alert and learning all day long.

Add to this the smart appearance of LITECONTROL'S standard lighting fixtures No. 9224 . . . plus their unusually low cost of upkeep . . . and there you have the three big advantages offered by LITECONTROL'S *complete line* of standard lighting fixtures: Good light for good sight, with good looks, and easy maintenance.

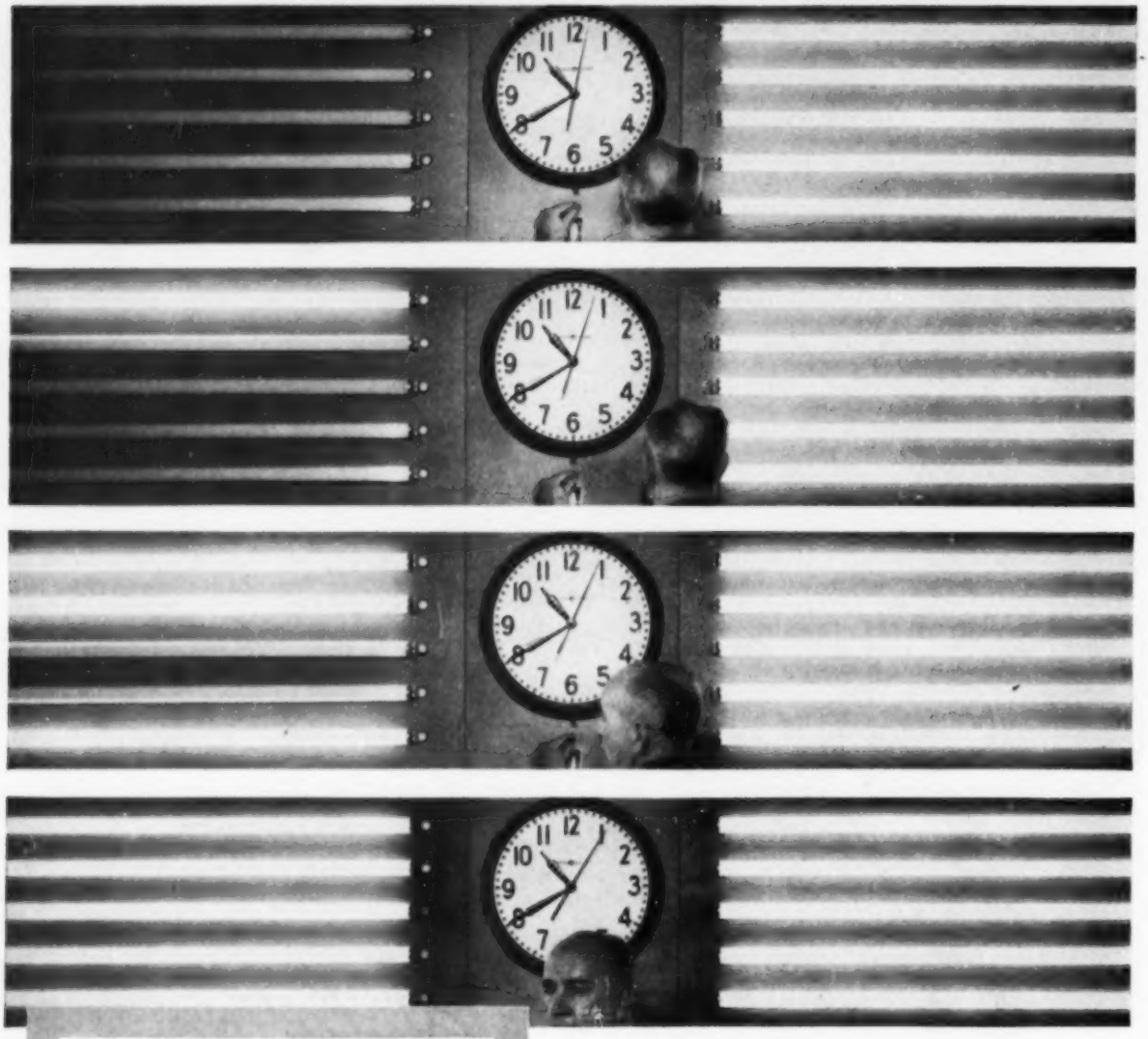
When you want the same — a lighting installation that's custom in appearance . . . at standard fixture costs — consult your local LITECONTROL Representative. *Reg. Trademark

LITECONTROL *Fixtures*

KEEP UPKEEP DOWN

LITECONTROL CORPORATION, 36 Pleasant Street, Watertown 72, Massachusetts

YOU EXPECT THE BEST VALUE FROM G-E FLUORESCENT LAMPS



**New G-E "Rapid Start" lamps light up twice as fast as others**

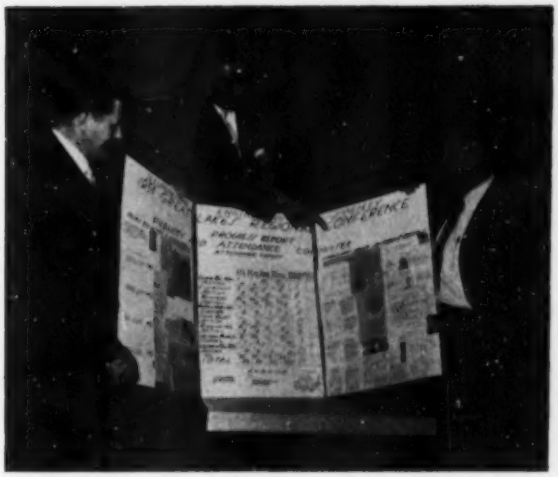
This series of pictures shows how General Electric can save you the annoyance of waiting for light.

All the lamps were started as the second hand on the clock reached zero. Within two seconds, the G-E Rapid Start lamps—right of the clock—were fully lighted. It was nearly *six* seconds before all the regular lamps, left, lit up.

G-E Rapid Start lamps eliminate the starter, cause of up to half of regular lighting maintenance troubles. They have long life, too. Reason: a triple-coil cathode that holds more starting chemical.

General Electric Rapid Starts are another example of why you can *expect* the best value from G-E fluorescent lamps. For free folder, "Facts About Rapid Start", write: General Electric, Dept. 166-1E-8, Nela Park, Cleveland, O.

GENERAL ELECTRIC

**Three-cornered handshake as Regional V-P L. C. Twichell congratulates Duncan Preston (left) and Floyd Sell, first prize winners of the Great Lakes Regional contest for My Most Interesting Lighting Job.**

**Looking at a progress report on the Conference are Publicity Chairman J. F. Finn; Registration Chairman J. E. Dawson and A. C. Sangster, Chairman of the Conference. Report covered attendance and publicity.**

uled each morning, and a luncheon and fashion show arranged for the ladies, of whom 68 were present, at the Book Casino Room of the hotel on Monday. On Tuesday, a planned tour of the Plymouth Motor Car Company, while intended for the ladies, attracted a number of the delegates as well.

### Good Ideas

The Great Lakes Conference was full of good ideas, carried out with finesse and experience. By far, the most outstanding was the staging and lighting for the technical sessions and the banquet, but the publicity campaign carried on prior to and during the conference was also worth copying. This phase of the operation was highly organized under the general chairmanship of James F. Finn, with a special committee man for publicity in each Section and Chapter of the Region. John W. Rulketter, once the conference was under way, handled Radio-News-Television assignments arranging for interviews with a number of speakers, and visiting V.I.P.'s, by radio and press, with appearances also on television programs.

A large chart for delegates to fill in banquet reservations and preferred seating enabled parties to get together with the least confusion.

A big blackboard on an easel was a handy thing to post messages and telephone calls.

Placards at the closed door of the session announced who was speaking.

There were two separate registration tables — one for advance registrations on one side of the lobby, the other for newly arrived not-yet-registered delegates. The registration tables were manned by Convention Bureau girls so experienced in this kind of thing that there were no hitches or delays.

On the program, there was space allowed for notes, a convenient and thoughtful item.

**King-sized telegram from National Conference Chairman read by President A. H. Manwaring during the Banquet. It reads "Don't dare forget to tell them about I.E.S. annual Technical Conference, Atlantic City, New Jersey, Sept. 13-17. A wonderful program planned with top notch speakers and international figures. Everybody will be there and will have a wonderful time." Signed: A. S. Turner, Jr., Executive Committee, I.E.S. Conference.**

### Credit Due

The Conference was so well planned, one would suspicion the entire membership of the Region was at work on it. Results, however, were from the joint efforts of many members in all of the Sections and Chapters within the Region, with the following taking the responsibility:

### Conference Committee

Lester C. Twichell.....*Honorary Chairman*
Alfred C. Sangster.....*General Chairman*
Harold H. Eckert.....*Secretary-Treasurer*
George S. Evans.....*Program Chairman*
James F. Finn.....*Attendance-Publicity*
H. Creston Doner.....*Display-Decoration*
Herbert E. Cook.....*Hotel-Banquet*
John E. Dawson.....*Registration*
Edward F. Brewster.....*Reception*
Paul Roth.....*Entertainment*
John W. Rulketter.....*Radio-News-Television*
Lloyd W. Crotser.....*Transportation*
Artel Henson.....*Chairman, General Committee*

Mrs. John T. Parks.....
Miss Kathleen Carolan.....
Mrs. Alfred C. Sangster.....
Mrs. Herbert E. Cook..... } *Co-Chairmen, Ladies Committee*

Central New York Section
Daniel L. Killigrew.....*Chairman*
Jack Engelman.....*Publicity*

Cleveland Section
M. A. Mortensen.....*Chairman*
Theodore Ake.....*Publicity*

Michigan Section
John T. Parks.....*Chairman*
J. F. Finn.....*Publicity*

Northwestern Ohio Chapter
Robert M. Taylor.....*Chairman*
Miss Rose Coakley.....*Publicity*

Ohio Valley Section
William V. Misrach.....*Chairman*
Robert W. Brown.....*Publicity*

Rochester Section
Floyd H. Owen.....*Chairman*
Carl Pollack.....*Publicity*

Western Michigan Chapter
Ronald C. Lyon.....*Chairman*
Arthur Sienker.....*Publicity*

Western New York Section
John F. Buckley.....*Chairman*
Gordon Rowe.....*Publicity*

Certificate of Appreciation was awarded to G. W. Beals Fellow (center). G. J. Taylor (left) made the presentation. Ed Cole, Conference Chairman, looks on.

Seen at the Northeastern Regional were: left to right, Walter Schwanhausser and Neel McIntyre of the New England Section with Bob Dorsey, guest speaker.

## Northeastern Region Successfully Experiments With One-Day Conference

The Northeastern Region of I.E.S. has proved without question that it isn't just play that attracts members to Regional Conferences. Their conference May 18 at Schaub's Restaurant, Hartford, Connecticut was one full day of technical sessions, with no social program and no entertainment except good fellowship. More than 150 attended, several coming all the way from Maine for the single day. Concentration was on an exceptionally valuable papers program, a procedure felt well worth it by those attending. The same number of papers, all very carefully chosen, were presented as at the more usual two-day conferences; six sessions were featured, including luncheon and dinner addresses.

The meeting was held at a large restaurant in the country, about nine miles out of Hartford. This in itself was a departure from usual practice, and one which contributed no little to the success of the conference. The building was turned over to I.E.S., so that the entire group were together throughout the meeting. Convivial get-togethers between sessions in bar, lobby and dining rooms provided sociability for the members, most of whom had driven to the conference from all parts of the Region.

### Indoctrination Meeting

On the day preceding the conference, 17 incoming and outgoing officers of the Sections and Chapters of the Region got together for an all-day meeting at the Bond Hotel in Hartford. On hand also were Dex Hinckley, Executive Secretary of I.E.S., and Ruby Redford, Editor of Illuminating Engineering, to answer questions for Headquarters. This meeting was a thorough indoctrination of national, regional and local projects, how best to proceed, with an open forum for the exchange of successful ideas. George J. Taylor, Regional V-P, and Wes McCormick, V-P-Elect, presided.

Indoctrination meeting, which preceded the Northeastern Regional Conference, was attended by incoming and outgoing officers from all Sections and Chapters in the Region.

### M.M.I.L.J.

The contest for "My Most Interesting Lighting Job" in the Northeastern Region was an especially successful project, actively promoted, followed and conducted by every Section and Chapter within the Region. Results were keenly contested entries from every Section. With George Taylor as Moderator, the contest was as follows:

First Prize — Leon T. Johnson (Public Service Company of New Jersey), New York Section. Mr. Johnson will represend the Region at the national contest in Atlantic City next month.

Second Prize — C. D. Hollister (presented by E. Barry as proxy), Eastern New York Chapter.

Third Prize — Edward R. Cole (Hartford Electric Light Co.), Connecticut Section.

(Continued on page 16A)

**GARCY VISUALIER**
Two-lamp and four-lamp units in 4 ft. and 8 ft. lengths for standard, rapid start or slimline lamps.

Take all the people who normally have a voice in the selection of lighting fixtures. Seat 'em around a conference table, and you can quickly get them to agree on Garcy.

The reason is that Garcy, by design, looks out for everyone's interest. Architects and designers like Garcy's clean styling and impressive appearance. Lighting engineers approve the high efficiency and low surface brightness which is combined, in the Visualier pictured above, with 45° x 45° shielding.

The exclusive one-piece shielding body is a favored feature with everyone. The complete louver, together with side panels, is formed as a single metal stamping . . . for great inherent strength, no rusting of welded parts, no loosening due to vibration.

For the electrical contractor, the one-piece shielding body is a real boon. With fewer parts to unwrap, carry up ladders and assemble, it saves many installation man-hours and dollars. Maintenance people are equally enthusiastic about the one-piece shielding body. Since it embodies 80% of the fixture's reflective surfaces, cleaning is fast and thorough. The shielding body may be cleaned by merely immersing it in a drum of detergent, leaving only the surface of the chassis to be cleaned by hand.

With Garcy it's "Quality . . . by design." Send for Catalog L-110.

**GARCY** *Quality by Design*

**GARDEN CITY PLATING & MFG. CO., 1760 N. Ashland Ave., Chicago 22, Ill.**
**In Canada: Garcy Co. of Canada, Ltd., 191 Niagara St., Toronto**

**George J. Taylor (right) Regional V-P congratulates Leon Johnson, Public Service Co. of New Jersey, and first prize winner in the My Most Interesting Lighting Job contest, representing the New York Section.**

**Contestants in the Regional MMILJ contest lined up from left to right: R. L. Smart, New England Section; Leon Johnson, New York Section; Edward Barry, proxy for C. D. Hollister, Eastern New York Chapter; Ed Cole, Connecticut Section.**

*(Continued from page 14A)*

FOURTH PRIZE — Raymond L. Smart (Boston Edison Co.), New England Section.

Judges for the contest were: L. R. Anderson, C. E. Waldron, D. E. Voorhies and Ruby Redford (Chairman).

PAPERS PROGRAM

In six sessions, all packed, the following papers were presented:

**Tuesday Morning, May 18**

Introduction to Conference—*F. Clark, General Chairman of Conference.*

MORNING SESSION

*Chairman* — E. R. Cole
(Chairman, Connecticut Section)

"My Most Interesting Lighting Job Contest"
Moderator — George J. Taylor, Regional Vice-President.

LUNCHEON

*Host* — George J. Taylor

Address of Welcome—A. M. Wade, Vice-President, Sustaining Member, Connecticut Light & Power Co.
President's Address — A. H. Manwaring, National President, I.E.S.

AFTERNOON SESSION
(First Half)

*Chairman* — H. A. Klopot
(Chairman, New England Section)

Life, Lumens and the Pursuit of Happiness—Edward Rambusch, Rambusch Decorating Co.
Lighting for the Varied Requirements of Shopping Centers — R. T. Dorsey, General Electric Co.
Architectural Use of Lighting — H. S. Kelly, Architect.

(Second Half)

*Chairman* — E. M. Fahey
(Chairman, New York Section)

Floodlighting and Sportslighting — R. H. Goodman, Crouse-Hinds Co.
Glare — Current Concept — Domina Eberle Spencer, Associate Professor of Mathematics, University of Connecticut.
Luminous Ceilings — H. A. Williams, Rohm & Haas Co.
Lighting Maintenance—Parts and Problems—Richard Townsend, Westinghouse Electric Corp.

DINNER

*Host* — George J. Taylor
(Regional Vice-President)

"Diamond Jubilee Report"—Samuel G. Hibben, Chairman, Jubilee Task Committee, I.E.S.

EVENING SESSION

*Chairman — D. E. Voorhies*
(Chairman, Eastern New York Chapter)

NEMA Association Activities — Laurance C. Mesnick, National Lighting Bureau.
I.E.S. Editor's Comments — Ruby Redford, Editor ILLUMINATING ENGINEERING.
Technical Director's Comments—C. L. Crouch, Technical Director, I.E.S.
Progress Report — T. C. Sargent, Sylvania Electric Products Inc.

CREDIT DUE

The Conference Committee responsible for this successful meeting were:

F. Clark ..... *Chairman*
W. Richards ..... *Finance*
P. Pokrop ..... *Program-Papers*
K. Estler ..... *Attendance*
R. Babcock ..... *Publicity*
J. Barney ..... *Registration—Reception*
F. Brown ..... *Registration—Hotel*
R. Harris ..... *Transportation—Entertainment*
E. Cole ..... *Arrangements*
R. Mills ..... *Arrangements*
L. Senofonte ..... *Arrangements*
The Mrs. Cole, Mills, Senofonte and Clark ..... *Ladies Committee*

**Connecticut Section**

E. R. Cole ..... *Chairman*
R. O. Mills ..... *Vice-Chairman*
L. Senofonte ..... *Secretary*

**New York Section**

E. M. Fahey ..... *Chairman*
R. A. Coradeschi ..... *Vice-Chairman*
L. R. Anderson ..... *Secretary*

**New England Section**

H. A. Klopot ..... *Chairman*
E. J. Perkins ..... *Vice-Chairman*
W. K. Leweilen ..... *Secretary*

**Eastern New York Chapter**

D. E. Voorhies ..... *Chairman*
H. H. Friedman ..... *Secretary*

**I.E.S. National Technical Conference**
**Hotel Chalfonte-Haddon Hall**
**Atlantic City, New Jersey**
**September 13-17, 1954**

## I.E.S. Members Meet At Southport Conference

At the summer meeting of the British I.E.S. in May, a meeting was held by members of the American Society and visitors. Mr. E. C. Hugh, of the Frink Corporation, New York City, addressed the group, speaking on lighting trends in the United States.

Recent publications of the American I.E.S. were displayed at the meeting, and it was proposed that these be housed at the British organization's library where they will be available to members of either Society.

This interesting session, giving members of the two groups a chance to get together, was planned and arranged for by Mr. Howard Long, member of the American organization's Membership Committee.

*(Continued on page 18A)*

Formed pan diffusers of PLEXIGLAS provide large-area luminosity and fixture-free appearance in ROOM LIGHTING.

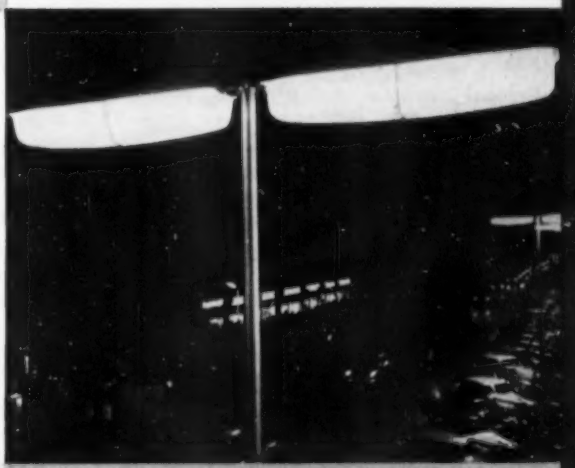
# PLEXIGLAS

## *the outdoor plastic— for Trouble-Free Lighting*

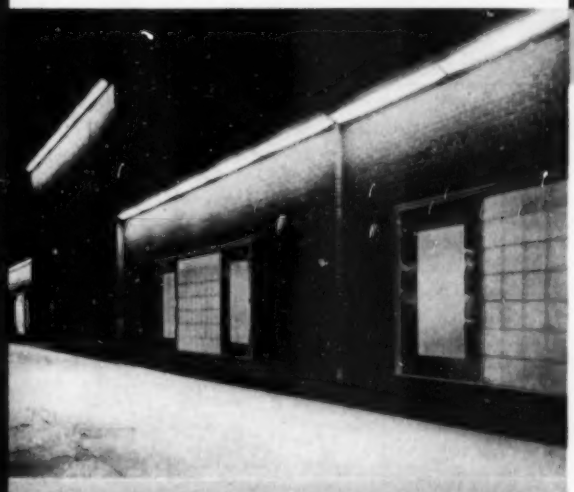
A plastic that can be used *outdoors* is your best assurance of trouble-free service in interior installations.

PLEXIGLAS acrylic plastic is noted for its dimensional stability, freedom from discoloration and resistance to breakage, regardless of the point of use. That is why it is the preferred material for diffusers, covers, and shields on lighting fixtures.

For outstanding durability, and maximum efficiency in the transmission and diffusion of light, specify PLEXIGLAS. We will be glad to supply details on the usefulness of this multi-purpose lighting material.



Injection-molded PLEXIGLAS covers protect fluorescent lamps in this new type of STREET LIGHTING.



PLEXIGLAS shields protect the light source in this unique SIDEWALK LIGHTING installation.

CHEMICALS FOR INDUSTRY

**ROHM & HAAS COMPANY**

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*Representatives in principal foreign countries*

PLEXIGLAS *is a trade-mark, Reg. U.S. Pat. Off. and in other principal countries in the Western Hemisphere.*

*Canadian distributor:* Crystal Glass & Plastics, Ltd., 130 Queen's Quay at Jarvis Street, Toronto, Ontario, Canada.

Midwestern Regional V-P Carter Lewis and President Manwaring examine the window display of the local utility, which featured the St. Louis Conference, and the publications of the I.E.S.

The Honorable Raymond R. Tucker, Mayor of the City of St. Louis, left, with George F. Herold, Chairman of the St. Louis Section. Mayor Tucker gave an address of welcome at the opening session of the Conference.

# Midwestern Regional Conference Meets in St. Louis

For several years now, St. Louis Section has represented go-gettiveness in the Society records. With the Midwestern Regional Conference scheduled at the Jefferson Hotel there June 17-18, they apparently set out to maintain this reputation, and frankly aimed at "the biggest and best of them all." This spirit of St. Louis was a big factor in the success of the meeting, and it definitely was successful.

With registration totalling 263, the Attendance and Finance Chairman should feel successful. With 348 members and guests at the banquet and great pleasure evidenced in other social affairs, the hard work of the Entertainment chairman paid off.

Best of all, though, was a sound papers program, a highly organized Lighting Contest, and two luncheon sessions — all of major value to attending delegates.

### Technical Sessions

Each major session of the Conference was opened with an invocation, an appropriate start in these days. Opening session prayer was by Rabbi Ferdinand M. Isserman of St. Louis, who accepted as a memento of the lighting conference a bronze medallion paper weight with the symbol of Light's Diamond Jubilee.

Welcoming address was by Raymond R. Tucker, Mayor of St. Louis, himself an engineer and well aware of the contributions of illumination to the community's progress. Main speaker at the opening session was A. H. Manwaring, President of I.E.S. Of special interest to those attending the packed session was Mr. Manwaring's discussion of the Society's Research program administered by the I.E.S. Research Fund.

Details of the papers program are included for the record at the end of this report. A meeting of importance not included in that list, however, was the Local Activities Luncheon, June 17. A lively and beneficial open forum was held at this meeting, attended by 30 incoming and outgoing local officers and Local Representatives from all of the Sections and Chapters of the Midwestern Region. Three headquarters staff members (Dex Hinckley, Ruby Redford and Clayton Ellis) were on hand to answer questions or outline national programs.

### Attendance by Sections

| | |
|---|---|
| Central Illinois Chapter | 3 |
| Chicago Section | 25 |
| Cornhusker Chapter | 5 |
| Heart of America Section | 10 |
| Indiana Chapter | 1 |
| Iowa Section | 8 |
| Milwaukee Section | 7 |
| Twin City Section | 7 |
| St. Louis Section | 112 |
| Non-Region Members and non-members | 45 |
| Ladies | 40 |
| | 263 |

### Lighting Contest

The "My Most Interesting Lighting Job" contest was taken very seriously in the Midwestern Region, with great benefit to its membership. The contest here was very carefully organized, with a Regional Chairman (Eric Church of Chicago) who stimulated and correlated local contests headed by local M.M.I.L.J. chairmen. This type of active promotion and organized effort resulted in 68 local entries throughout the Region, seven of which won first prize locally, competing with one another at the Regional contest. These were:

First Prize — E. A. Schaefer, Milwaukee Section, who will represent the Region at Atlantic City.

Second Prize—Mrs. Mary Stafford, Iowa Section.

Third Prize—Vernon T. Kempf, Chicago Section.

Runners up —

George E. Ransford, Indiana Chapter.
Henry Poehling, St. Louis Section.
Cecil H. Branham, Twin City Section.
C. E. Carter, Central Illinois Chapter.
D. L. Donelson, Cornhusker Chapter.

All of the entries were on display throughout the Conference.

Judges for the Regional contest were from each of the competing Sections and Chapters:

| | |
|---|---|
| *Indiana Chapter* | D. T. Fortner |
| *Iowa Section* | Richard Holcomb |
| *Milwaukee Section* | H. W. Grosh |
| *St. Louis Section* | W. H. Simms |
| *Twin City Section* | L. E. Johnson |
| *Central Illinois Chapter* | Irwin Been |
| *Chicago Section* | Carl Basedow |
| *Cornhusker Chapter* | C. R. Tracy |
| *Non-Region* | Ruby Redford |

(Continued on page 20A)

# WILSON

## "LUVE-TILE"

**This latest development in modern interior lighting is a boon to contractors because . . .**

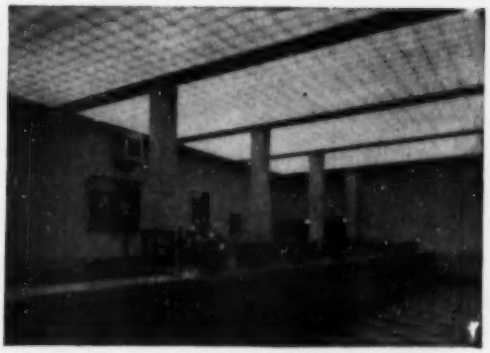
- It is extremely simple to calculate the amount required for the installation.
- There are only four basic elements to use! A modular 12" square of rigidly molded polystyrene louvre, a clip, a hanger and a strap.
- There are no complicated T-bars necessary to support "Luve-Tile".
- "Luve-Tile" always aligns perfectly and pleases customers with its symmetry.
- "Luve-Tile" is scientifically designed and is correct from an efficiency and brightness viewpoint.
- When the installation is complete, it is very simple to maintain—an important factor in customer approval.

For complete information on "Luve-Tile" write for Catalog, Section #8.

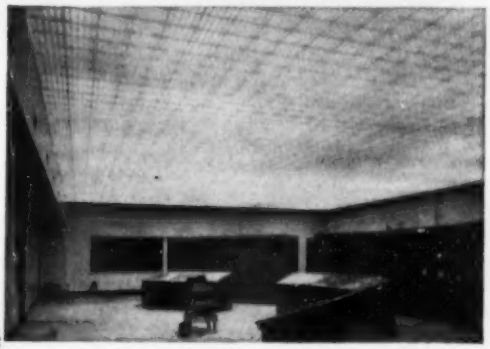
**J. A. WILSON LIGHTING & DISPLAY INC.**

995 MAIN ST. — BUFFALO 3, N. Y. — Phone Grant 2135

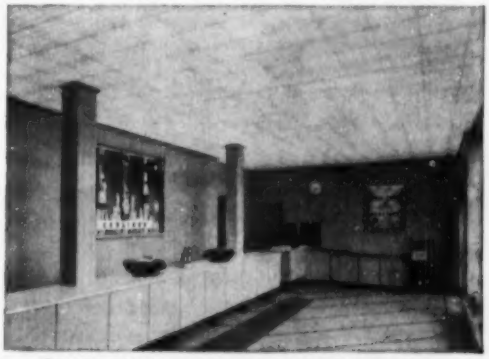
*In Canada:* 280 Lakeshore Road, Toronto 14, Ontario



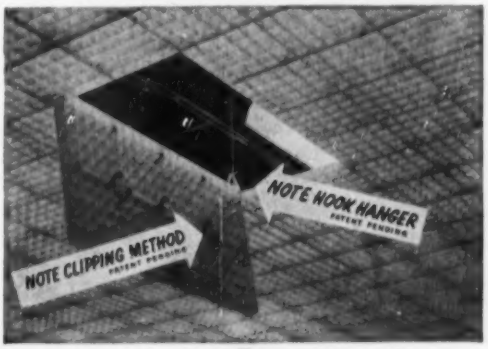
● Illustration shows a modern bank installation, where "Luve-Tile" helped to achieve an air of efficiency.



● In this power control room, "Luve-Tile" has successfully cut down glare and eyestrain.



● "Luve-Tile" was a major factor in achieving the modern appearance of this retail store.




ANOTHER WILSON FIRST

**Panoramic view showing some of the 348 members and guests attending**

### Entertainment

Kick-off for the conference was a cocktail party the night before opening day. Hosts at this affair were the St. Louis Section and an "About Town" committee of Sustaining Members. The party afforded a good opportunity to get acquainted, and a festive "convention" feeling for out-of-town arrivals.

An equally gay social affair wound up the final evening, when almost the entire delegation attended the famous St. Louis Municipal Opera to hear "The New Moon." Nature cooperated in this out-of-doors event, with a full moon and a balmy Southern summer night.

In between, on Thursday night, St. Louis Section hosted a banquet and dance at the Jefferson Hotel. Presiding chairman was C. Carter Lewis, Midwestern Regional Vice-President; Henry Arendes was Master of Ceremonies. No speeches — all gaiety, even the award ceremonies. These included checks to the winners of M.M.I.L.J. presented by Eric Church, contest chairman, and a carafe set to the Cornhusker Section, winner of the attendance prize. D. L. Donelson accepted this for his Section. Suspense and the pleased excitement of lucky winners accompanied a ticket-number drawing for some 15 prizes to ladies —fitted evening bags.

To Mr. Arendes as M.C., fell the pleasant duty of presenting to President Manwaring, gifts for himself and Mrs. Manwaring on behalf of the Region. Mr. Manwaring received a Golden Hour clock, and accepted for Mrs. Manwaring in her absence, a most elegant fitted bag. Thereafter, dancing till one.

**Entries in the Regional contest for MMILJ, who were all first prize winners in the Sections and Chapters, are: left to right, E. H. Schaefer, who placed first; D. L. Donelson, from the Cornhusker Chapter; A. P. Larson, proxy for the Indiana entry of G. E. Ransford; Mrs. Mary Stafford, who placed second; H. J. Poehling of St. Louis; Vernon Kempf, third place award; D. Brown, proxy for C. E. Carter of Central Illinois; and Cecil Branham, Twin City Section entry.**

### Ladies Program

There were 40 visiting ladies at the conference, all set for a happy convention trip to St. Louis. The program awaiting them more than met expectations. They started out, of course, immediately they arrived with the cocktail party Wednesday evening. This was followed the same evening by a Mississippi River Show Boat, with a choice of Cinerama or a moonlight (and it was full moon) boat trip instead.

After a Kaffee Klatch Thursday morning, the day was filled, right up to the banquet, with options of a TV show, a guided tour of the city, visits to the levees. Preceding the open-air opera Friday night, visiting ladies enjoyed a Breakfast and Style Show at Scruggs, Vandervoort, Barney, Inc., department store. This was followed by a luncheon at famous Medart Restaurant and a tour of the Busch Estate, as guests of Anheuser-Busch Co.

### Good Ideas

1. An envelope of mimeographed papers of the entire technical session to each delegate.

2. An attendance competition between the Region's Sections and Chapters. Winner was determined by number of persons attending percentage-wise against the total membership of the Section or Chapter as of the last elections, multiplied by the airline mileage from the Section or Chapter headquarters city to St. Louis. Cornhusker Section won a carafe set for their speakers' rostrum.

3. Advance registration speeded this phase noticeably; careful records were kept of all registrations as to Section

**the Banquet at the St. Louis Conference.**

affiliation, hotel room number and other useful data.

4. Invocation and closing prayer, conducted alternately by leaders of Jewish, Catholic and Protestant faiths.

5. Organized display of M.M.I.L.J. entries.

6. Special assembly room for the ladies.

### Papers Program

A listing of the papers presented scarcely does justice to the fine program presented. For the record, however, these were:

**Thursday Morning, June 17th**

Invocation, Rabbi Ferdinand M. Isserman, Temple Israel, St. Louis.
Introduction of the Mayor of St. Louis.
Address of Welcome — Honorable Raymond R. Tucker, Mayor, City of Saint Louis.
President's Address—A. H. Manwaring, President, Illuminating Engineering Society.
Local Activities Luncheon Meeting.

**Thursday Afternoon, June 17th**

*Chairman* — J. R. Chambers
Chairman, Chicago Section

Cost Analysis of High Bay Lighting, Vern Kempf, Jos. T. Ryerson & Sons, Inc.
Life, Lumens and the Pursuit of Happiness, Edward Rambusch, Rambusch Co., New York City.
My Most Interesting Lighting Job Contest, Eric H. Church, Regional Contest Chairman.

**Thursday Evening, June 17th**

Banquet and Dance.
Regional Winner Awards — "My Most Interesting Lighting Job" contest.

**Friday Morning, June 18th**

*Chairman* — D. T. Fortner
Chairman, Indiana Chapter

Lighting for Varied Requirements for Shopping Centers, R. T. Dorsey, General Electric Co., Cleveland.
Church Lighting, Carl Basedow and Dave Mason, Mason & Basedow Co., Chicago.
Color and Accent Lighting for Stores, D. P. Caverly, Sylvania Electric Products Co. Inc., New York.

**Luncheon**

*Chairman* — Lawrence E. Johnson
Chairman, Twin City Section

Invocation, Dr. Wesley H. Hager, President, Metropolitan Church Federation of Greater St. Louis.
Address, J. W. McAfee, President, Union Electric Company of Missouri.

**Friday Afternoon, June 18th**

*Chairman* — George F. Herold
Chairman, St. Louis Section

Q. & Q. with Economy in Classroom Lighting, Edwin H. Lauth, City Sales, Inc., St. Louis.
Light's Diamond Jubilee, Sam G. Hibben, Westinghouse Electric Corp., Chairman, I.E.S. Jubilee Committee.
Progress Report, C. Carter Lewis, Midwestern Regional Vice President.
Closing Prayer, Reverend John S. Daly, S.J., Saint Louis University, Institute of Technology, Student Advisor.

**Friday Night, June 18th**

Night at the Opera — St. Louis Outdoor Muny Opera — Forest Park — Sigmund Romberg's "New Moon."

**Special Feature**

**Friday Morning, June 18th**

All entries, not just the winners, in regional "My Most Interesting Lighting Job" Contest on display until 2:00 P.M. under direction of Willis Mangold — Ollie Westburg, Co-Chairmen.

### Credit Due

All of the Sections and Chapters in the Region chipped in with time and talent to make this meeting the success it was. In addition, special credit is due many earnest members of the host Section, headed by the following committee chairmen:

C. Carter Lewis ..... *Midwestern Regional V-P*

Conference Executive Committee

L. M. Wallace .... *General Conference Chairman*
E. C. Ryan ..... *Vice Chairman*
J. J. Rhoades ..... *Vice Chairman*
E. L. Ehret ..... *Vice Chairman*
Brooks Chassaing ..... *Secretary-Treasurer*
H. J. Poehling ..... *Program*
W. H. Simms ..... *Arrangements*
E. J. Voepel ..... *Papers*
E. W. Stohlmann .... *Publicity and Attendance*
Dan Michelson ..... *Hotel and Registration*
R. D. Cohen ..... *Reception and About Town*
E. H. Lauth ..... *Transportation*
P. Q. Olschner ..... *Ladies Committee*
Henry Arendes ..... *Banquet and Dance*
J. C. Payer ..... *Opera Night*
H. J. Butler & Fred Guth .... Honorary *Members*
M. M. Busan ..... *Props and Equipment*
R. M. Conrad, Jr.
*Chairman, Central Illinois Chapter*
J. R. Chambers .... *Chairman, Chicago Section*
E. J. Pardun .... *Chairman, Cornhusker Chapter*
J. C. McDonald
*Chairman, Heart of America Section*
D. T. Fortner ..... *Chairman, Indiana Chapter*
H. R. Weibel ..... *Chairman, Iowa Section*
H. W. Grosh .... *Chairman, Milwaukee Section*
G. F. Herold ..... *Chairman, St. Louis Section*
L. E. Johnson .... *Chairman, Twin City Section*
M. H. Pearson.... *Chairman, Twin Ports Chapter*

**Eric Church, Chairman of MMILJ Contest, and Mrs. Mary Stafford, second place winner in the regional competition. Looking on at right is Larry Paist, formerly Regional V-P.**

**A present for the President—Henry Arendes, M.C. at the Banquet, hands Prexy Manwaring the gift of a Golden Hour clock. There was also an evening bag for Mrs. Manwaring, who could not attend the Conference.**

# the P&K story

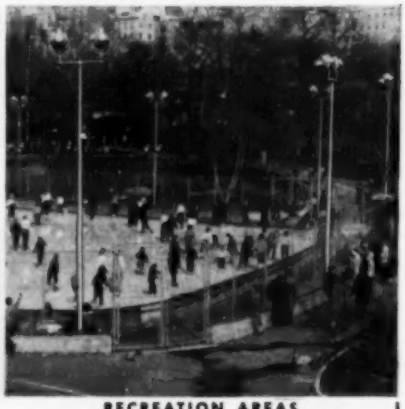
HIGHWAYS

DRIVE-INS

## BETTER LIGHTING everywhere

SHOPPING CENTERS

PARKING AREAS



RECREATION AREAS

## AT LOWER COST to everybody

Pfaff & Kendall, originator of the Seamless Tapered Aluminum Lighting Standard and Tapered Elliptical Arm, is now producing designs and types to meet any highway, road, area, bridge and traffic signal requirement.

Wherever P & K All-Aluminum Standards and Brackets are specified and installed, the story is the same: *Fewer technical problems . . . rapid, easy installation . . . greater lighting efficiency . . . and the kind of economy you can figure in actual dollars!*

**P & K All-Aluminum Standards and Brackets are always the wisest choice . . .**

**LIGHT WEIGHT for lowest cost installation.**
**NEGLIGIBLE CORROSION for longest service.**
**NO PAINTING means large, year-after-year savings.**
**SALVAGEABLE, RE-USABLE in event of knockdown.**

**WRITE FOR LATEST P & K CATALOG... and use the P & K planning and advisory services without obligation.**

**Pfaff & Kendall**
84 Foundry Street
Newark 5, New Jersey

## Ten Contestants in M.M.I.L.J. at Atlantic City

Every Region of I.E.S. will be represented at the national contest for My Most Interesting Lighting Job next month. That makes ten entries in the contest, all of whom have already won first prize in their Section or Chapter, and first at the Regional contest as well. The national competition is scheduled to be held during the I.E.S. National Technical Conference in Atlantic City, N. J., September 13-17. The ten contestants are as follows:

Canadian Region, Quebec Chapter, P. A. Ducasse, Terreau & Racine Ltee.

East Central Region, Philadelphia Section, J. J. Tynan, Atlantic City Electric Co.

Great Lakes Region, Michigan Section, Floyd Sell and Duncan Preston, Detroit Edison Co.

Inter-Mountain Region, Rocky Mountain Section, Lyle M. Bailey, The Albert Sechrist Mfg. Co.

Midwestern Region, Milwaukee Section, E. H. Schaefer, Wisconsin Electric Power Co.

Northeastern Region, New York Section, Leon T. Johnson, Public Service Electric & Gas Co., Newark, N. J.

Pacific North West Region, British Columbia Section, Eric Ackland, E. E. Ackland & Associates.

Southern Region, New Orleans Section, Louis N. Goodman, Louis N. Goodman and Associates.

South Pacific Coast Region, San Diego Chapter, Starr V. Monsees, Electrical Division, City of San Diego.

Southwestern Region, Alamo Section, Floyd Covington, Jr., Post Engineers, Fort Sam Houston.

**TEAM which won first place in the East Central Regional contest for My Most Interesting Lighting Job, here pose with a plywood model, true scale replica of the General Office Building of the Atlantic City Electric Co. Left to right are: John McCullough, Spencer Brown, J. J. Tynan and William Fowler.**

## Adequate Wiring Aims Outlined to Trade Press

Members of the Conference Group on Coordination of Electrical Industry Sales and Promotional Programs met with the electrical trade press June 29 at a press conference in New York City. Associations represented on the Conference Groups at present include:

Edison Electric Institute
International Association of Electrical Leagues
National Appliance and Radio-TV Dealers Association
National Association of Electrical Distributors
National Electrical Contractors Association
National Electrical Manufacturers Association

J. Reed Hartman, Vice-President of the Cincinnati Gas and Electric Company, and Chairman of the Conference Group, led discussion of the Conference Group's first year activities and accomplishments, and plans for the future. Public awareness of the need for adequate wiring was listed as problem number one for the entire electrical industry during the coming year, with several groups already studying this serious bottleneck to electrical progress. Included in detailed information to the press was a report on the activities of the National Adequate Wiring Bureau. Speaking for the Conference Group, Mr. Hartman said: "We must back up the intensified national effort with more aggressive promotion (of adequate wiring) at the point of sale — the local level. The electrical industry locally should organize itself following the patterns of the successful local electrical leagues and adequate wiring bureaus. The electrical industry must tie in locally with national promotions in order to profit more fully from the national programs."

## I.E.S. Delegate Appointed To Mississippi Inauguration

I.E.S. member Professor Harry C. Simrall was the delegate appointed by the Society's President A. H. Manwaring to represent the Illuminating Engineering Society at the formal inauguration of Dr. Benjamin F. Hilbun as President of Mississippi State College, July 14. Professor Simrall, who is head of the Electrical Engineering Department at the college, is the I.E.S. Local Representative in State College, Miss.

## Roadway Lighting Study Carried on at U. of C.

An experimental thoroughfare to test roadway lighting was fully lighted for the first time recently at the University of California's Engineering Field Station. The elaborately lighted stretch of road at Richmond is 400 feet long, wide enough for four lanes of traffic, and has 60 lighting units of 20 different commercial types on both sides.

The new experimental road will be used by University engineers to study the visual effects of roadway lighting — an increasingly important field in which the technical knowledge is not too well developed. Research is under the direction of Dan M. Finch, professor at the University's electrical engineering department and associate research engineer at the Institute of Transportation and Traffic Engineering in Richmond.

Professor Finch has said that the new installation is the nation's most complete set-up for studying roadway lighting — a field of increasing interest for three reasons: (1) nighttime driving has increased greatly; (2) nighttime automobile accidents account for three times the number of fatalities and twice as many personal injuries as daytime accidents, with only one-third the traffic of daylight hours; (3) many cities are replacing their street lighting systems and will want only the most up-to-date and efficient systems.

California engineers will rely on the

*(Continued on page 24A)*

combined facilities of the new test roadway and the lighting laboratory at Berkeley to attempt to meet the demands of these problems.

All major, commercial models of roadway luminaires are installed into the setup, using the four existing types of light sources: incandescent, mercury vapor, sodium vapor, and fluorescent. Tall poles, spaced about 50 feet apart on both sides of the 400-foot roadway, bear as many as five or six lamps each. Forty lighting combinations are possible, and a cable grid structure will allow changes in spacing of the luminaires according to specific needs.

Illumination measurements are taken with a photometer to determine the amount of light reaching the surface of the road. A brightness meter is used to measure the light reflected to the driver's eye. A new instrument, called a "contrast meter" (see October 1952 I. E., "An Instrument for the Evaluation of Night Visibility on Highways") will measure how visible an object is in terms of the amount of contrast it presents against a background. Instruments will be calibrated in the laboratory at Berkeley, where much of the experimental data obtained at the Engineering Field Station will be analyzed.

Future plans for the experimental roadway involve laying sections of different types of pavement to investigate the role a roadway surface plays in visibility. These sections will probably be laid in two strips which will be added to the present route. A 1000-foot extension in one direction will simulate conditions on a two-lane street in a residential area. In the other direction, the test road will be extended about 1500 feet to represent a street in a metropolitan area incorporating problems associated with arterial lighting. The present blacktop route represents a four-lane highway.

**AT THE Conference of the National Electrical Contractors' Association, Districts Six and Eight, in Reno, Nevada, June 24-26, are: l. to r., Don Clayton, president, N.E.C.A.; Russell Mills, past-president, A.I.A., Daniel Rashall, Sunbeam Lighting Co., and R. J. Reitz, district governor, N.E.C.A.**

## I.E.S. Regional Conferences — 1955

(Tentative Schedule)

| | | |
|---|---|---|
| Southern | Fort Harrison Hotel<br>Clearwater, Florida | March 31-April 1 |
| Southwestern | Gunter Hotel<br>San Antonio, Texas | April 3-5 |
| Inter-Mountain | Phoenix, Arizona | April 11-13 |
| South Pacific Coast | Statler Hotel<br>Los Angeles, California | April 14-15 |
| Pacific Northwest | Vancouver, British Columbia | April 25-26 |
| Midwestern | Edgewater Beach Hotel<br>Chicago, Illinois | May 2-3 |
| Canadian | Mount Royal Hotel<br>Montreal, Quebec | May 12-13 |
| East Central | To be announced | May ——— |
| Northeastern | Fort William Henry Hotel<br>Lake George, New York | June 10-11 |

## Carolinas Section Joins In Parade of Homes Program

A framed Certificate of Merit will be presented, by the Carolinas Section of I.E.S. to those builders in the 1954 Parade of Homes meeting the minimum lighting standards recommended by the Society. In co-operation with the officers of the Charlotte Chapter of the National Association of Home Builders, this type of recognition will be awarded at a dinner meeting in September.

The homes will be judged by a committee of three and not more than five, selected to represent architects, engineers and decorators. The Carolinas Section has made up a specification sheet showing a theoretical house costing $17,000 and covering 1400 to 1600 square feet of floor area, and a listing of minimum permanent fixtures to comply with the "Recommended Practice of Residence Lighting."

Section members in charge of this project are J. M. Foreman, J. J. Cardo and W. M. Kirkpatrick.

## Food Store Lighting Clinic Repeated by Large Chains

The outstanding success of the full-day clinic on Food Store Lighting, held last February at the Chicago Lighting Institute, was such that two large chains of food stores have repeated the event.

The second annual Store Engineering Clinic of the Independent Grocers Alliance was held at the Institute, June 6 and 7, with an attendance of 67 store engineers from all over the nation. Special lectures were arranged on lighting, refrigeration and air-conditioning with illustrations, models and samples.

The Associated Food Retailers of Greater Chicago, who had also participated in the February clinic, have scheduled a session at the Institute as a regular feature of the July 25-28 conference of the National Association of Retail Meat and Food Dealers to which they were hosts.

## I.E.S. Represented at Anniversary Of Engineering Experiment Stations

Among the 36 representatives of national and international scientific and engineering societies honoring the fiftieth anniversary celebration of Engineering Experiment Stations in the United States were Professor E. M. Strong, Past-Presi-

(*Continued on page* 29A)

NEW BENJAMIN "PANEL-GLO"

NEW BENJAMIN "SKY-GLO"

## You need not forego the many advantages of a Benjamin Luminous Louvered Ceiling... comparative costs show why!

Even when you compare on the simple basis of material and fixture costs alone, it is often more economical to use a Benjamin Ceiling as against conventional individually-hung units. Especially in areas where it is desired to modernize by lowering the ceiling to cover up ugly ducts, pipes or cracks, Benjamin Louvered Ceilings are even more economical. In addition to furnishing higher light-levels, these "ceilings of light" actually modernize old-fashioned store areas, schoolrooms, offices, etc. to make them "look young again" without plastering or other re-decorating expense.

Send for FREE "Sky-Glo" and "Panel-Glo" Data Bulletin. Benjamin Electric Mfg Co., Dept. I Des Plaines, Illinois.

**NEW Simplicity brings down installed price!**
New, practical, easy-to-handle 3' x 3' translucent panels or louver sections.

**NEW, Easier installation brings down installed price!**
No need to order "fill-in" size panels. Trim them yourself with scissors... right on the job... to the exact shape desired!
New metal FINISHING STRIPS neatly hide trimmed edges on either louver or luminous-panel jobs.

**NEW,** proven TRANSLUCENT plastic material means MORE LIGHT with CONTROLLED BRIGHTNESS.
(Same material used for "Sky-Glo" and "Panel-Glo.")

Benjamin "Sky-Glo" and "Panel-Glo" Ceilings are approved by Underwriters' Laboratories

**NOW, figure the complete price of a ceiling-lighting job by the sq. ft.!**
Sq. ft. price includes all panels or louver sections as well as all the channels, fittings, etc. you need to complete the installation!*
No calculating, no figuring... just know the area of the room!
No layouts necessary for regularly-shaped rooms.
*lighting equipment not included.

**BENJAMIN** *Lighting Equipment*

*sold exclusively through electrical distributors*

B-4253

**Supt. Frank D. Lawler, whose School Building Committee insisted on the most comfortable lighting, reports . . . . . .**

# . . "We wanted the best lighting available so we installed Westinghouse CD Luminaires"

"When we built the new Mary P. Hinsdale School, our School Building Committee insisted on the best and most comfortable lighting available. Westinghouse CD's have certainly lived up to those expectations," reports Superintendent Frank D. Lawler, Town of Winchester, Winsted, Conn.

The Westinghouse CD luminaire, with plastic shielding, provides a semi-indirect lighting system. Installed in continuous rows, as is shown in this classroom, the result is an almost glareless system of comfortable lighting. The entire ceiling becomes a part of the lighting system; all lamps are completely shielded.

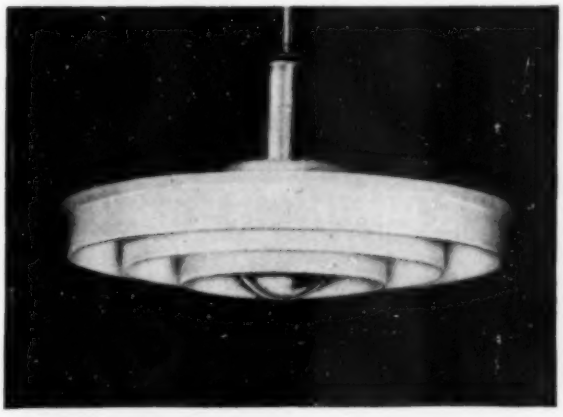
What's more, the Westinghouse CD makes an attractive addition to the classroom. Its design simplicity fits as a natural part of the background in modern interiors.

The superintendent further reports, "Our teachers and the school board are very pleased with the new lighting system. Their enthusiasm and that of our parents will undoubtedly influence both future construction and any remodeling of present classrooms."

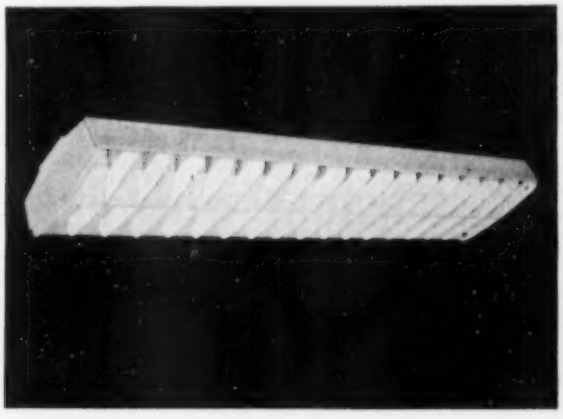
Warranty LIGHTING FIXTURES

For other installation methods, get B-4556, "The ABC Plan for School Lighting". Meantime—*look for this seal on your electrical contractor's guarantee. He installs them—we back him up.* Westinghouse Electric Corp., Box 868, Pittsburgh 30, Pa. J-04340-B

## And to meet other requirements . . .



**Low FIRST cost** Concentric Ring incandescent luminaires meet quality lighting requirements on limited funds. Metal rings shield silvered bowl lamps, eliminating glare and shadows.



**LC Luminaires**—with *luminous corners*—bring new economies to fluorescent lighting not only in rugged efficiency but also in low maintenance and quality components.

LIGHT FOR FREEDOM · LIGHT'S DIAMOND JUBILEE · POWER FOR PROGRESS

YOU CAN BE SURE... IF IT'S Westinghouse

PRODUCTION LINE TESTING FOR REGULATING ACTION: Here a Sola Constant Wattage Ballast for rapid-start lamps is being tested by varying primary voltage input from 106-130v. Light output must vary less than ±2% of rated value. The last two microammeters on the right of the upper row measure the light variation recorded by a photoelectric cell exposed to the lamps mounted on the back of the test board. This is one of several rigorous quality control checks made on these ballasts.

# Sola rapid-start ballasts maintain lumen output ±2% constant with line voltage variations of 20%

If you purchase, specify, install or manufacture fluorescent lighting equipment, you can eliminate the undesirable effects of line voltage fluctuations through use of constant wattage ballasts. Even the best engineered fluorescent lighting fixtures cannot deliver their rated lumen output in the face of adverse voltage conditions, when operating from non-regulating ballasts.

Rapid-start fluorescent lighting systems offer the advantages of both instant-start and pre-heat fluorescent. When operating from Sola Constant Wattage Ballasts for rapid-start lamps, they will deliver rated lumen output within ±2% regardless of line voltage variations from 106-130v.

The Sola Constant Wattage Ballast Circuit also results in other important benefits: 300v from lamp to starting aid for positive starting . . . peak/rms ratio of approx. 1.5 @ 118v with excellent wave shape for long lamp life . . . cool operation . . . self-protection against damaging heat rise when lamps fail . . . absolute safety when relamping.

Write for full information, or request a Sola sales engineer to call and give you all the facts on superior fluorescent lighting...Sola-ballasted rapid-start systems.

**Reduces relamping . . . keeps lumen output constant.**

**SOLA** *Constant Wattage* **BALLASTS**

CONSTANT VOLTAGE TRANSFORMERS for Regulation of Electronic and Electrical Equipment • LIGHTING TRANSFORMERS for All Types of Fluorescent and Mercury Vapor Lamps. • SOLA ELECTRIC CO., 4633 West 16th Street, Chicago 50, Illinois, Bishop 2-1414 • NEW YORK 35: 103 E. 125th St., TRafalgar 6-6464 • PHILADELPHIA: Commercial Trust Bldg., Rittenhouse 6-4988 • BOSTON: 272 Centre Street, Newton 58, Mass., Bigelow 4-3324 CLEVELAND 15: 1636 Euclid Ave., PRospect 1-6400 • KANSAS CITY 2, MO.: 406 W. 34th St., Jefferson 4262 • Representatives in Principal Cities

(Continued from page 24A)

dent of I.E.S. and A. D. Hinckley, the Society's Executive Secretary. The anniversary was marked at a special dinner, June 15, at the University of Illinois, Urbana, during the week-long joint convention of the American Society for Engineering Education and the Engineering College Research Council.

The principal address at the dinner, which was attended by some 400 delegates, was given by Dr. Lee DuBridge, President of the California Institute of Technology, who spoke on "Goals of Research." Professor Strong and Mr. Hinckley represented the I.E.S. Research Fund and the Society, respectively.

**SPONSORS AND WINNERS** in the Lighting Design Contest at the University of Maine are: l. to r., Professor K. L. Parsons, of the University; R. B. McFarland of Central Maine Power; Guy Twombley, Robert Fogel, Robert Willett, and Philip Lord, students; and Wilbur D. Chadeayne, of Bangor Hydro-Electric.

## Bibliography on Lighting Available from Headquarters Office

A list of books, publications and periodicals, compiled and kept up-to-date by the I.E.S. Committee on Lighting Education, is available from the Technical Department at I.E.S. headquarters office. Consisting of nine mimeographed sheets, this bibliography on light and lighting covers publications which make a definite contribution to the field of illumination, grouped according to the subject matter which they represent.

These sections are (1) Lamps and Lighting, (2) Architecture and Lighting, (3) Physics of Light—Optics, (4) Color, (5) Light, Eyesight and Health—Related Psycho-Physiological References, (6) Trade Papers and Professional Journals in both English and foreign languages.

**TECHNIQUES** in hair styling and in lighting beauty parlors and barber shops were the twin-topics at this meeting in Springfield, Mass., where K. E. Estler (right) spoke for the lighting portion of the program. The session was sponsored by Western Massachusetts Electric Co., General Electric and the Breck Company.

## Winners Announced in Maine Student Lighting Contest

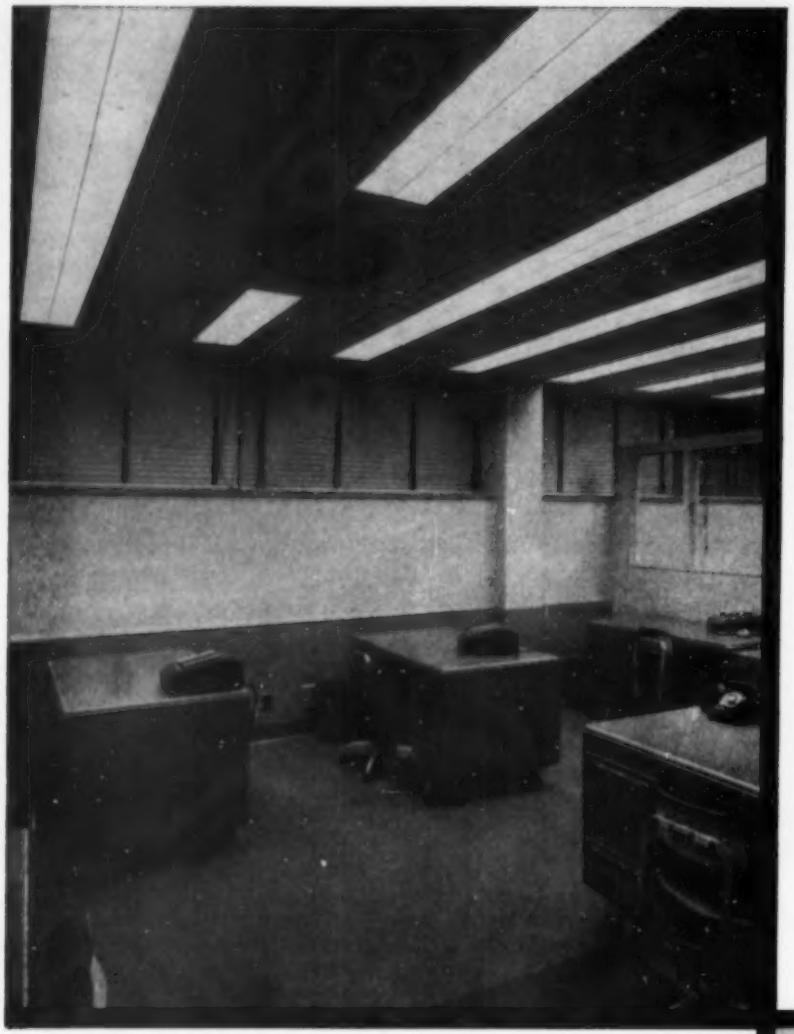
The winners of the first annual Lighting Design Contest for students at the University of Maine were announced at a banquet held at the Anchorage Hotel, Old Town, Maine, June 5.

The contest is the result of the desire on the part of three prominent Maine members of the Society to do something to interest engineering students in the practical aspects of illumination. These members are Professor Kenneth L. Parsons of the University of Maine, Raymond McFarland, Lighting Director at Central Maine Power Co., and Wilbur Chadeayne, Lighting Engineer with Bangor Hydro-Electric.

With the cooperation of the University, the contest was made available to the students studying the prescribed course in illumination. The problem was the lighting of a new publicity bureau building. Each student submitted his best solution according to standards of quantity, quality, architectural suitability and cost of equipment. Included in the engineering was footcandle calculations using flux and point-by-point methods. Brightness ratios were also to be considered.

Judges in the competition were: Ambrose Higgins, of Crowell, Lancaster and Higgins, Architects; Robert Hudson, formerly lighting director of Central Maine Power Co., and Richard Brown,

(Continued on page 31A)



Now, for the first time in louvered fixtures, low-brightness comfort is possible from *all* viewing angles—crosswise or lengthwise.

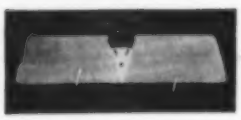
For example, the office installation at the left. Day-Brite Alzak aluminum parabolic troffers on 3-foot centers literally bathe the office in light. When measured after six months in service, readings averaged 140 footcandles.

Yet—because these troffers are equipped with Day-Brite's new PARA-LOUVERS—this high level installation is *completely comfortable* from any spot in the room, looking up, down, diagonally or straight across the fixtures.

With the fast-growing demand for increased visual comfort in lighting, the PARA-LOUVER is one of the most important developments in years.

# PARA-LOUVER® LIGHTING— LOWERS LENGTHWISE BRIGHTNESS BY 50%

DECIDEDLY BETTER
**DAY-BRITE**
*Lighting Fixtures*



This is a PARA-LOUVER®—an exclusive, patented development by Day-Brite engineers. A series of scientifically calculated parabolic segments are coined into the flat aluminum surface giving the PARA-LOUVER the desirable properties of parabolic reflection. When used in the Day-Brite Alzak parabolic troffer, the PARA-LOUVER lowers lengthwise brightness of the fixture by 50%—without changing its efficiency.

*For more detailed information about the PARA-LOUVER, write for Bulletin OD-593. Address Day-Brite Lighting, Inc., 5432 Bulwer Ave., St. Louis 7, Mo. In Canada: Amalgamated Electric Corp., Ltd., Toronto 6, Ontario.*

485

**CALL OR WRITE YOUR NEAREST DAY-BRITE REPRESENTATIVE**

(*Continued from page 29A*)

Jr., Lighting Director of Boston Edison Co.

Three prizes were awarded:

First — $75 — Guy Twombly, Brooks, Maine.

Second — $40 — Robert Willett, Great Works, Maine.

Third—$25—Tie between Robert Fogel, Lewiston, Maine and Phillip Lord, Lisbon, Maine.

After the awards were made, a general informal discussion was led by Mr. McFarland, and Dick Kelley, of General Electric, presented an interesting talk on street lighting and sports lighting.

Results of the contest were most gratifying, with students and faculty both expressing appreciation. From all accounts it will be a regular yearly activity at the University of Maine, sponsored by Central Maine Power and the Bangor Hydro-Electric Co.

## Reading Project Started For Young Graduate Engineers

The Engineering Society of Cincinnati in conjunction with the Cincinnati and Hamilton County Public Library has embarked on a program designed to stimulate additional interest in selected reading on the part of young graduate engineers.

A collection of 80 selected volumes from the "Reading List for Young Engineers" has been furnished by the public library. These books are placed on a loan basis in the library of the Herman Schneider Foundation Building, which is headquarters for all engineering society activity in the Cincinnati area.

This activity is part of a pilot study project of the Engineers' Council for Professional Development to determine what aspects of community life can be of assistance and inspiration to young engineers in their personal and professional growth during the first few years after graduation. The over-all program known as "The First Five Years of Professional Development" aims at stimulating the young engineer in the period when he is learning to grow on his own initiative.

The recommended reading program is based on the concept that the two most important attributes of a professional man are (1) the ability to deal with men and affairs, and (2) the ability to read and absorb the written experience of others. Titles selected for the expanded library collection include outstanding books in the fields of natural science, philosophy, psychology, history, biography, art, travel, poetry, essays, fiction, economics, sociology, business and industrial management.

In addition, the committee is encouraging the regular reading, by the young engineer, of at least one periodical to keep informed on current professional affairs. Journals and magazines of the national engineering societies are suggested for this purpose.

# LIGHTING CALENDAR

## Society Events

**September 13-17, 1954**—Illuminating Engineering Society. National Technical Conference, Chalfonte-Haddon Hall, Atlantic City, N. J.

**March 31 - April 1, 1955** — Southern Regional Conference, Ft. Harrison Hotel, Clearwater, Fla.

**April 3-5, 1955** — Southwestern Regional Conference, Gunter Hotel, San Antonio, Texas.

**April 11-13, 1955** — Inter Mountain Regional Conference, Phoenix, Arizona.

**April 14-15, 1955** — South Pacific Coast Regional Conference, Statler Hotel, Los Angeles, Calif.

**April 25-26, 1955** — Pacific Northwest Regional Conference, Vancouver, B. C.

**May 2-3, 1955** — Midwestern Regional Conference, Edgewater Beach Hotel, Chicago, Ill.

**May 12-13, 1955** — Canadian Regional Conference, Hotel Mount Royal, Montreal, Que.

**June 10-11, 1955** — Northeastern Regional Conference, Ft. William Henry Hotel, Lake George, N. Y.

## Industry Events

**August 30 - September 1, 1954** — International Association of Electrical Inspectors, Eastern Section, Atlantic City, N. J.

**September 1-16, 1954**—International Electrotechnical Commission, Golden Jubilee Meetings, University of Pennsylvania, Philadelphia, Pa.

**September 8-10, 1954**—The American Society of Mechanical Engineers, Fall Meeting, Schroeder Hotel, Milwaukee, Wis.

**September 13-15, 1954** — International Association of Electrical Inspectors, Southwestern Section, Elko, Nevada.

**September 22-24, 1954**—Canadian Electrical Manufacturers Association, Sheraton Brock Hotel, Niagara Falls, Ont., Canada.

**September 23-25, 1954** — International Association of Electrical Inspectors, Northwestern Section, Portland, Oregon.

**September 27-30, 1954** — Institute of Traffic Engineers, Annual Meeting, Hotel Muehlbach, Kansas City, Mo.

**September 29 - October 2, 1954** — International Association of Electrical Leagues, Bellevue Stratford Hotel, Philadelphia, Pa.

**October 3-6, 1954** — National Association of Electrical Distributors, Pacific Zone Convention, Mark Hopkins Hotel, San Francisco, Calif.

**October 4-6, 1954** — International Association of Electrical Inspectors, Canadian Section with Ontario Chapter, King Edward Hotel, Toronto, Ontario, Canada.

**October 11-13, 1954** — International Association of Electrical Inspectors, Western Section, Louisville, Ky.

**October 11-15, 1954**—American Institute of Electrical Engineers, Fall General Meeting, Chicago, Ill.

**October 17-22, 1954**—Society of Motion Picture and Television Engineers, Semi-annual Convention, Los Angeles Ambassador, Los Angeles, Calif.

**October 18-22, 1954** — 42nd National Safety Congress & Exposition of the National Safety Council, Chicago, Ill.

**October 24-27, 1954** — Board of Governors, National Association of Electrical Distributors, Hershey Hotel, Hershey, Pa.

**October 25-27, 1954**—International Association of Electrical Inspectors, Southern Section, Tampa Terrace Hotel, Tampa, Fla.

**October 27-30, 1954** — National Electrical Contractors, Annual Convention, Jung Hotel, New Orleans, La.

**November 8-11, 1954** — National Electrical Manufacturers Association, Haddon Hall Hotel, Atlantic City, N. J.

**November 15-17, 1954** — 41st National Foreign Trade Convention, Waldorf-Astoria Hotel, New York, N. Y.

**November 15-17, 1954** — American Standards Association, 5th National Conference on Standards and 36th Annual Meeting, Hotel Roosevelt, New York, N. Y.

**November 18-19, 1954** — National Farm Electrification Conference, Schenectady, N. Y.

**November 28 - December 3, 1954** — The American Society of Mechanical Engineers, Annual Meeting, Statler Hotel, New York, N.Y.

**January 7-11, 1955** — National Retail Industry Show, Madison Square Garden, New York, N. Y.

**January 31 - February 4, 1955** — American Institute of Electrical Engineers, Winter General Meeting, Hotel Statler, New York, N. Y.

**March 13-18, 1955** — National Electrical Manufacturers Association, Edgewater Beach Hotel, Chicago, Ill.

**June 27 - July 1, 1955** — American Institute of Electrical Engineers, Summer General Meeting, New Ocean House, Swampscott, Mass.

## Incoming Officers Elected By Vancouver Island Chapter

At the annual dinner meeting, May 28, the Vancouver Island Chapter of I.E.S. elected its officers for the 1954-1955 year. These are: Chairman, Gordon J. Roper, British Columbia Electric Co., Ltd. and Secretary-Treasurer, Walter E. Beck, also of B. C. Electric. Board of Man-

(*Continued on page 32A*)

**I.E.S. Committee on Testing Procedures for Illumination Characteristics at its May 24-25 meeting at the National Bureau of Standards. Left to right, Arthur Weeks, Chairman of Subcommittee on Electrical Measurements; R. P. Teele, Past-Chairman of the Testing Procedures Committee; Kurt Franck, present Chairman; A. E. Krawcek, Secretary; C. L. Crouch, Technical Director, I.E.S.; and E. H. Salter.**

(*Continued from page* 31A)

agers consists of John Armour, W. G. McIntosh and Kenneth Reid.

Attending the meeting were quite a few special guests, including Regional Vice-President Walter J. Lind and Mrs. Lind. Mr. Lind gave a short talk on the I.E.S. in Industry.

Other specially-invited guests were

R. W. Siddall, Chairman, Vancouver Island Section, Architectural Institute of British Columbia, and Mrs. Siddall.
L. Patterson, Chairman, Vancouver Island sub-section, American Institute of Electrical Engineers.
T. Mawson, President, Victoria Electrical Association, and Mrs. Mawson.
V. Dawson, Electrician in charge of installation of the illumination at Butcharts' Gardens.

The dinner meeting was held in the Sidney Hotel Banquet Room, and after the meeting, members and guests visited the famous Butcharts' Gardens, which have recently been illuminated under the direction of Chapter Chairman, Percy F. Fletcher.

## IT SEEMS TO ME

### Let's Sell Lighting

It seems to me that selling "fixtures" has brought about the most devastating conditions in the lighting industry that have been experienced in its history. Because "fixtures" are being sold, much of our business is done on price; and because of price, below minimum standards.

For example, poorly designed fixtures, difficult to install, and which are costly to maintain, have wide acceptance. Ballasts of minimum and below minimum standards are being sold in volume. What has happened is that many frightened, uninformed, untrained, and some shortsighted people are selling what assumes the appearance of luminaires to "get the order."

To stop selling fixtures and to start selling lighting is the only answer. No customer ever buys fixtures. He doesn't care if he ever sees or owns a fixture. He certainly would never be interested in having expensive units suspended one way or another in his place of business or his school except for the fact that he must have illumination to produce some end result.

A simple review of what has happened since the inception of the fluorescent lamp emphasizes the present day blindness to past experience. Many opportunists, at the start of the fluorescent industry, peddled bare lamp fixtures and brought about a dissatisfaction with fluorescent lighting, since many users were never exposed to proper application of the fluorescent lamp. Today, the same opportunists and additional opportunists are using inferior ballasts, poor design and construction, and false claims to again "make a quick buck" and again produce a wave of dissatisfaction in a large segment of the users.

I have had the extreme good fortune to be able to hear the address of a well known lighting engineer, pleading with a group of fellow manufacturers to be less practical in terms of dollars and cents and to emphasize their responsibility to produce equipment incorporating not only good components but designed with proper control of brightness. This approach is what I mean when I say we should sell *lighting*, not fixtures.

It behooves all of us in the lighting field today to think, advertise and sell in terms of "lighting." This will produce a more educated buying public, more satisfied users, more business, and will also serve our great responsibility as an industry, the preservation of sight. Let's stop selling fixtures and start selling lighting! JOSEPH A. SCHNELLER, *Director of Sales, Lighting Products, Inc., Highland Park, Ill.*

## OBITUARY

**Charles Gordon Pyle,** executive director of the National Association of Electrical Distributors, died July 16, at the Lawrence Hospital in Bronxville, New York. Mr. Pyle was 60 years of age, and his death came after many months of illness.

Mr. Pyle had been with the association since 1942, and prior to that was general sales manager of Sylvania Electric Products, Inc.

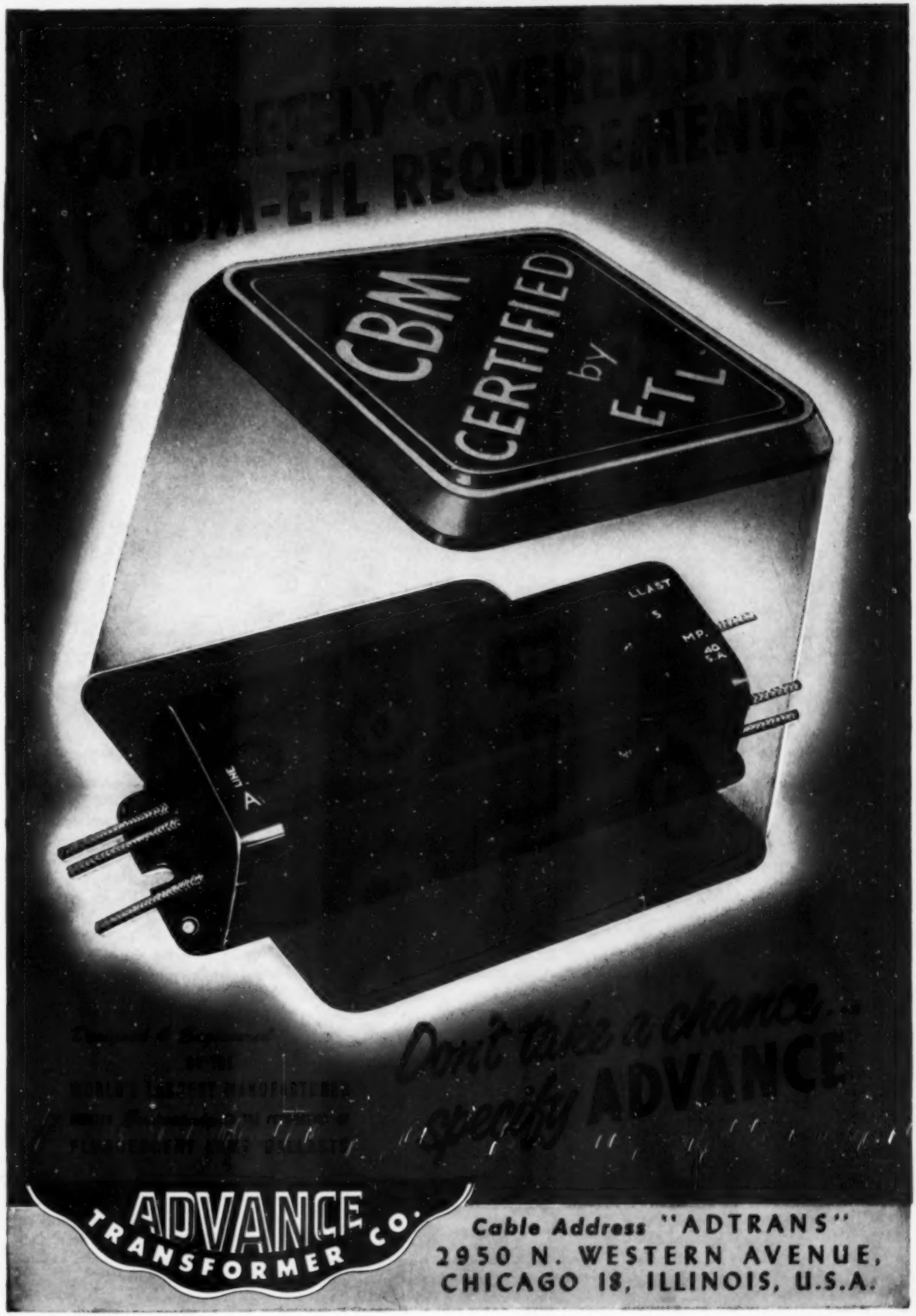
## ABOUT PEOPLE

**H. A. Stroud,** Promotion Manager of the Monongahela Power Co., Fairmont, West Virginia, has been elected Chairman of the Better Light Better Sight Bureau, succeeding **S. L. Drumm,** who has been Chairman since 1952. Mr. Stroud has been active in the Bureau affairs for over ten years.

**Arthur C. Barr,** illuminating engineer at General Electric Co., has been named manager of quantity consumer sales for the company's Lamp Division. Named to fill Mr. Barr's former position in the Application Engineering Department is **Charles L. Amick,** who has been coordinator of sales aids for that department.

**Gordon W. Howson** has been appointed Atlantic regional manager for the Westinghouse Lamp Division. Mr. Howson succeeds **George B. Mackey,** who has been transferred to San Francisco, Calif., as Pacific Coast regional manager. In his new position, Mr. Howson will direct activities in the greater Philadelphia area and half of Pennsylvania, parts of New Jersey,

(*Continued on page* 34A)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**OFFICERS elected at the National Association of Lighting Maintenance Contractors conference held in Cincinnati, May 19 to 21. Left to right are: Francis Clark, Regional V-P, Northern Section; Edward I. Creed, Regional V-P, Central Section; Luther H. Nunnally, Secretary-Treasurer; Walter C. Fink, Jr., President and George Kort, Regional V-P, Southern Section.**

*(Continued from page 32A)*

West Virginia, Kentucky, Tennessee and North Carolina and all of Delaware, Maryland, Virginia and the District of Columbia. Mr. Mackey will direct activities in nine western states, Hawaii and Alaska. **Andrew G. Nelsen** has been appointed to fill Mr. Howson's former position as Chicago district manager.

**Elgin B. Robertson,** President of Elgin B. Robertson, Inc., Dallas, Texas, and President of the American Institute of Electrical Engineers, received an honorary degree of doctor of engineering from Southern Methodist University at the recent commencement.

**Dr. Charles M. Slack** has been granted a year's leave of absence as director of research and engineering for the Lamp Division of Westinghouse Electric Corp. During his absence, **Dr. R. M. Zabel,** manager of engineering, will assume overall engineering responsibilities for the division. In addition to managing the product engineering department, he will participate in the broad planning and policy programs of the organization.

**Thomas G. Broussard** has been named regional engineer for the Atlantic Region of Westinghouse Lamp Division and will be located in the Philadelphia area. Mr. Broussard was formerly lamp design engineer at the Division's Bloomfield headquarters.

**Donald J. Mayer** has been named manager of General Electric Lamp Division's Bellevue, Ohio lamp works, succeeding the late **William S. Nyerges,** who died June 3. At the same time, announcement was made of the appointment of **Daniel M. Mulholland,** plant superintendent of the Memphis plant to fill Mr. Mayer's former position as manager in Memphis.

**Carl W. Zersen,** Managing Director of the Chicago Lighting Institute, has become a member of an advisory council in the field of electricity, sponsored by the Vocational Department of the Chicago Public Schools. The council, comprised of civic leaders representing a cross-section of the electrical field, is to further the interests of technical and vocational students by a closer relationship between school administrators, supervisors and teachers, and representatives of business, industry and civic organizations.

The appointment of **Byard M. Pawson** as manager of the newly created industrial relations department of Westinghouse Electric Supply Co., has been announced. Offices of the new executive will be located at company headquarters at 40 Wall St., New York City. Mr. Pawson was previously supervisor of industrial relations for the Westinghouse Lamp Division at Fairmont, W. Va.

**Robert R. Clark** has been appointed manager of the new plastics division of the Pyle-National Co., Chicago, Ill. The new division is for the development and sale of fiber glass reinforced polyster resins. Mr. Clark was formerly with Respro, Inc. of Cranston, R. I.

Day-Brite Lighting Inc. has announced the appointment of some new representatives in the West. **Don and Fred Gleason** will represent the company in the State of Washington with headquarters in Seattle. Their territory will also include Alaska. **Paul G. Krick** has been named as representative in the Montana territory with headquarters in Butte. Mr. Krick was formerly Apparatus and Lighting Manager for Electric Supply Co., in Albuquerque, N. M.

**A. Carl Bredahl** has been named director of technical services for Westinghouse Electric Corp.'s general advertising department. Mr. Bredahl has been manager of the company's Better Homes Bureau since 1947. In his new capacity he will be responsible for national trade shows and displays, product packaging design, consulting service, and will represent the firm on industry committees having to do with wiring and exhibits.

## BOOKS AND PAMPHLETS

*Books whose reviews are marked * are available for inspection at Headquarters Office, Technical Department.*

***Engineering Analysis—An Introduction to Professional Method,** by D. W. Ver Planck and B. R. Teare, Jr., published 1954 by John Wiley & Sons, Inc., New York, N. Y. 344 6 x 9 pages; $6.00.

This book is described as an application of the case method to the teaching of the philosophy and methods of engineering analysis. The subject is developed by example, showing what must be done to translate engineering situations into mathematical language, and what is necessary after a mathematical result has been obtained. The book treats a number of subjects from the point of view of use and understanding, including material from dynamics of translation and rotation, electric circuits, heat transfer, uses of power series, etc. A collection of problems representative of those met in engineering are presented to give the student experience with what the book aims to teach.

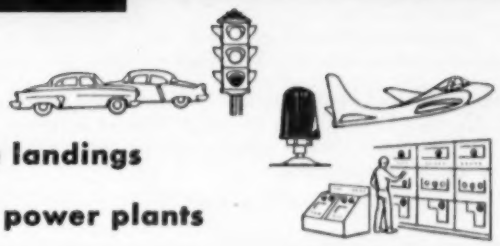
The authors are Head, Department of Mechanical Engineering, and Dean, College of Engineering and Science, at Carnegie Institute of Technology.

*(Continued on page 38A)*

**———— say "go" to traffic**

**———— guide aircraft to safe landings**

**———— signal "all's well" in power plants**



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BUMP AND JOLT ME ALL YOU WISH TOUGH, ROUGH SERVICE* IS MY DISH!

***Two special lamps engineered to solve specific lighting problems.***

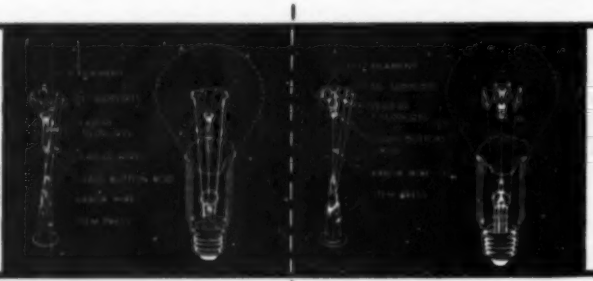
These 2 important Sylvania lamps look alike, but each is designed for a different kind of industrial service.

**The Vibration Service Lamp** is equipped with a special *flexible* tungsten filament held in place by extra filament supports. Thus it stays on the job longer when placed on or near fast-moving or vibrating equipment.

**The Rough Service Lamp** is engineered to resist jolts caused by rough handling. This lamp, too, has extra supports. In addition, its selected filaments are specially coiled to resist sudden shock.

Both of these lamps feature Sylvania's improved shock-absorbing mounts (see diagrams). These are formed of spring-steel arbor wire which protects the filament and glass button rod from heavy jolts and vibration. Every industry needs both of these "Tough Twins." Get them from your Sylvania supplier or write to Dept 4L-3508, Sylvania today!

†Showing construction detail of Sylvania 100 Watt Vibration Service Lamp and shock-absorbing mount.



*Note difference in the design of Sylvania's 100 Watt Rough Service Lamp.

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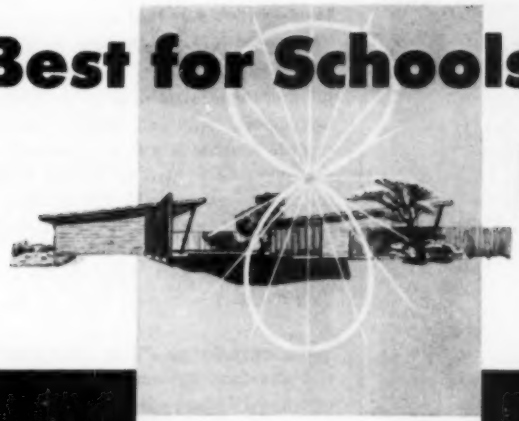

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**TRANSLUCENT SIDES**
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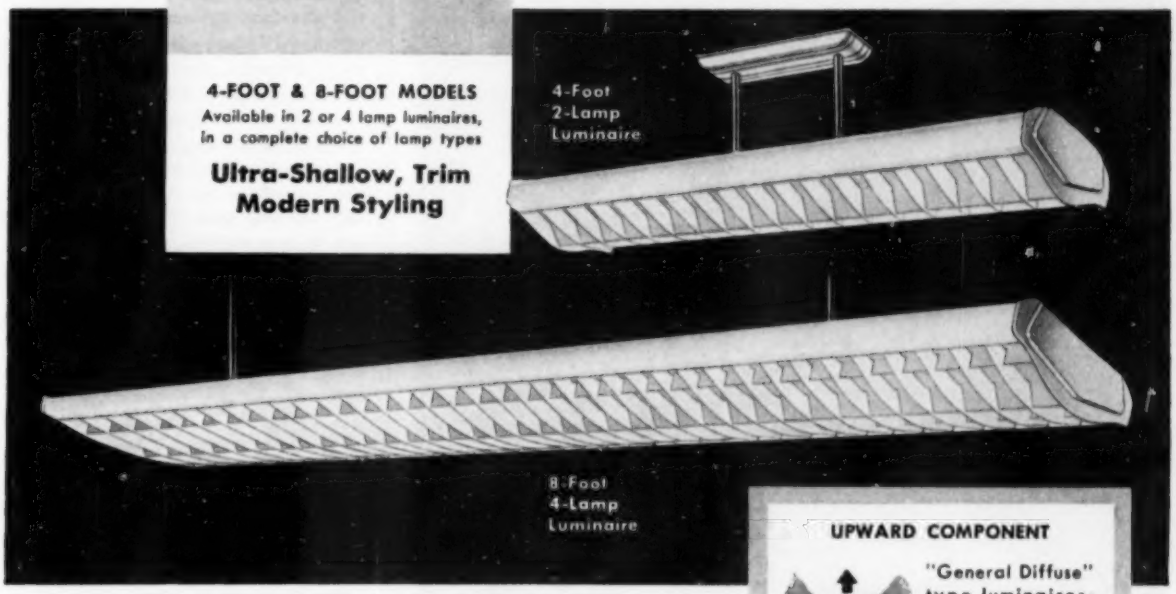
**35°/25° SHIELDING***

**4-FOOT & 8-FOOT MODELS**
Available in 2 or 4 lamp luminaires, in a complete choice of lamp types

**Ultra-Shallow, Trim Modern Styling**




**UPWARD COMPONENT**

"General Diffuse" type luminaires; approximately half the light goes up to be reflected from ceiling or upper walls for comfortable, glare-free, uniform lighting.

**SEMI-TRANSLUCENT SIDES**

Provides low brightness contrast, creating modern streamlined appearance. Plastic sides and louver are one easy-to-handle unit.

## modern lighting planned for today's schools— superior illumination with low cost maintenance

MITCHELL engineering perfects a new standard for school lighting. The "LODESTAR" Luminaire offers abundant light distribution with an absence of glare to approximate daylight conditions. This important lighting advance is attained by the substantial upward component with its "general diffuse" lighting effect, the semi-translucent side panels with pleasing low brightness contrast, and the superior louver design (35°/25°* cutoff) which delivers properly shielded illumination to working areas. Smooth styling, very low maintenance factor and surprisingly low cost make the MITCHELL "LODESTAR" Luminaires the wisest choice for School Lighting.

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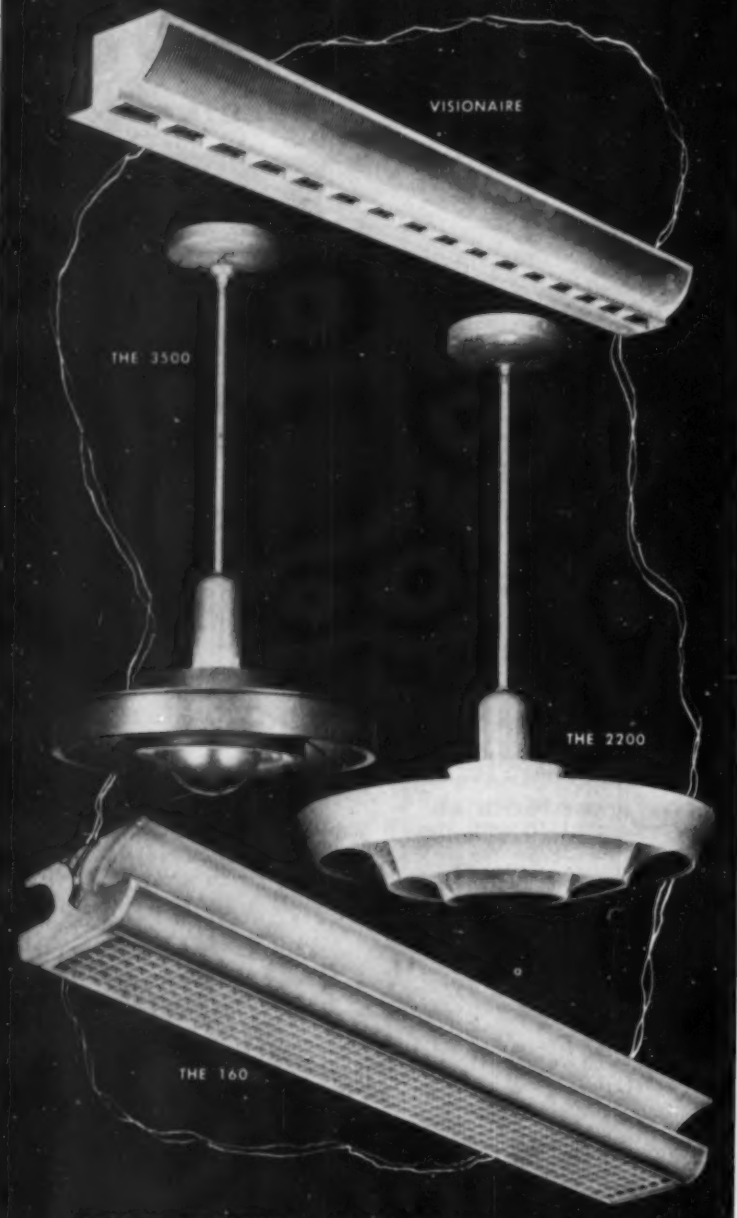


DETAILED BULLETINS are available upon request. Just write the name of the unit(s) on a post card and mail to

Silvray LIGHTING, INC.

BOUND BROOK NEW JERSEY


(*Continued from page 34A*)

**From Penzance to Menlo Park** is a new 24-page children's booklet about the inventors who failed to make a successful incandescent bulb and Edison, who succeeded. Illustrated with photographs and drawings and written by Edythe Polster the booklet is designed for distribution in connection with the Light's Diamond Jubilee program. For information on quantity prices, write Miss Polster at 55 East Tenth Street, New York, N. Y.

**Bibliography on Filing Classification and Indexing Systems** for engineering offices and libraries is a listing of references prepared for engineers and librarians concerned with organizing their own files or the files in the offices or libraries where they work. The references are to articles in magazines, books and pamphlets on filing, classification and indexing, lists of subject headings, and hand-sorted punched card systems suitable for organizing small collections of engineering books, notes, correspondence, abstracts, etc. Some of the listed items are general, some related to specific subject fields. ESL Bibliography No. 9, with 79 annotated references, 18 pages, mimeographed, is available from the Engineering Societies Library, 29 West 39th St., New York 18, N. Y. Price: $2.00.

**The Octopus in the House** is a booklet of cartoons stressing the need for adequate wiring in homes, with the increased use of electrical appliances. Prepared by "Dud" Rice, manager of the Surface Raceway Department of National Electric Products Corp., the booklet is available from that company at 2 Gateway Center, Pittsburgh 22, Pa., at a price of 3½ cents per copy.

**Building Better from Modular Drawings,** 24-page pamphlet, explains modular coordination in building materials and the advantages deriving from it. Prepared by William Demarest, Jr., Secretary for Modular Coordination of the American Institute of Architects, the booklet is available at a price of 20 cents from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

**National Directory of Safety Films,** an annual publication of the National Safety Council, is a comprehensive listing of motion pictures available from a wide variety of sources for safety education within business and industry, on the farm, in homes and on streets and highways. Brought up to date each year and with three quarterly supplements for

each edition, the directory is available from the Council at 425 North Michigan Ave., Chicago 11, Ill. Prices range from 75 cents for single copies to 50 cents for quantities of 1000 or more.

**Selling Electric Service — 1879-1954,** a 72-page brochure, tells the story of the sales and business development problems in the early years of the electrical industry and of how they were solved. Written by W. E. Clement of New Orleans Public Service Inc., the booklet contains reminiscences of the author's more than 50 years in the industry. It is available from the Electrical Association of New Orleans, 921 Union St., New Orleans 12, La. Prices range from $1.00 for single copies to $.70 for quantities over 300.

**Techniques of Plant Maintenance and Engineering — 1954,** the annual volume containing the proceedings of the Plant Maintenance and Engineering Conference, this year contains the text of papers by 24 authors and answers to over 1300 questions. Included also is a summary of 20 roundtable discussions devoted to specific industries. Cloth-on-board bound, with 291 pages, the book is illustrated with 55 diagrams, charts and tables. For those who did not attend the conference, the book may be obtained from Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y. for $7.50.

**The Eager Minds,** a new motion picture, released as part of the celebration of Light's Diamond Jubilee, tells the story of electrical progress and the developments in the industry. Scenes for the color film were shot in utility and manufacturing plants throughout the country and the re-creation of the Menlo Park scenes was taken in Edison's original laboratory. Prices for the film, and the film itself, can be obtained from Light's Diamond Jubilee Committee, 2650 Graybar Building, 420 Lexington Ave., New York 17, N. Y.

## NEW MEMBERS

At the meeting of the I.E.S. Council Executive Committee, held in New York, N. Y., July 8, 1954, the following were elected to membership. Names marked * are transfers from Associate Member grade.

ALAMO CHAPTER

*Associate Member:*
Swanson, J. A., Jr., Westinghouse Electric Corp., Corpus Christi, Texas.

ARIZONA CHAPTER

*Associate Member:*
Lurek, J. G., Utilities Supply Co., Phoenix, Ariz.

*(Continued on page 42A)*


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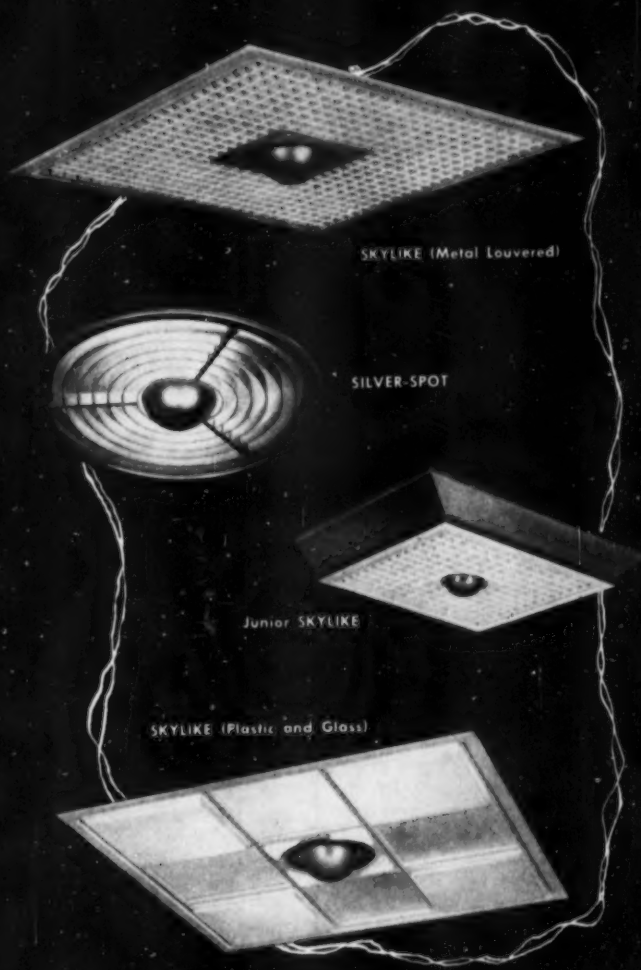


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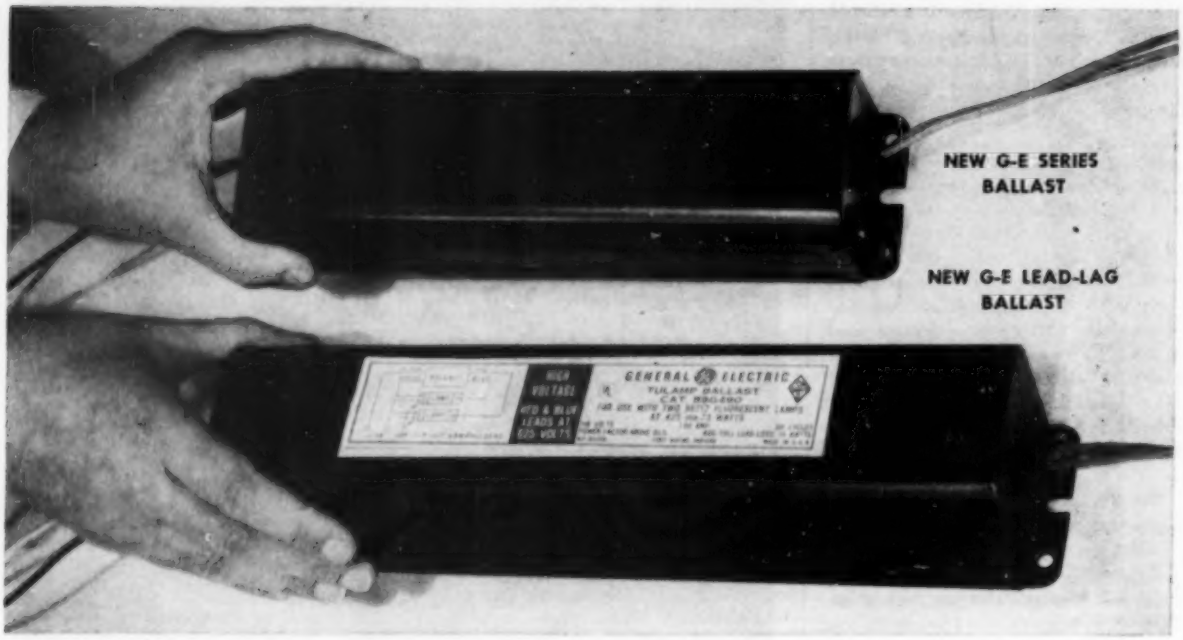


# New G-E Series and Lead-lag Ballasts ... Compare and Choose for Yourself

Here is a comparison of G.E.'s two new ballasts for operation of 96T12 lamps at 425 ma. Catalog No. 89G496 is the newly designed series ballast—smaller, lighter, quieter. Catalog No. 89G490 is the similarly redesigned lead-lag ballast.

**BOTH BALLASTS ARE CBM CERTIFIED** and contain that full measure of extra quality which G-E engineers into every ballast, but the series ballast, by its inherent design characteristics, gives you more value for your dollar. However, if you prefer lead-lag instead of series, the new lead-lag ballast has been designed to give you the most value compared to other lead-lag ballasts.

**THE SERIES BALLAST** gives you equivalent performance, in accordance with lamp specifications, and offers a substantial savings in cost and size. At right is a comparison of these two General Electric ballasts. The major areas of difference are printed in bold face. You can see that the series is less expensive, uses less line current, has less wattage loss, weighs less, is smaller, and has a quieter sound rating.

Compare and choose for yourself.

For further information on either series or lead-lag ballasts, write to Section 401-6, General Electric Co., Schenectady 5, New York.

| SERIES 89G496 | | LEAD-LAG 89G490 |
|---|---|---|
| 73 | Nominal lamp watts | 73 |
| 110–125 | Circuit voltage | 110–125 |
| 60 | Frequency | 60 |
| **1.55** | **Line Current in Amps** | **1.60** |
| .425 | Lamp Current in Amps | .425 |
| **28** | **Watts Loss** | **36** |
| 90% | Min line power factor | 90% |
| **$10.15** | **List Price Each** | **$12.60** |
| 6 | No. Units per Package | 6 |
| **65** | **Approximate Ship weight** | **74** |
| D | Sound Rating | E |
| **11¾** | **Over-all length** | **14⅛** |
| **11 9/64** | **Mounting Length** | **13¾** |

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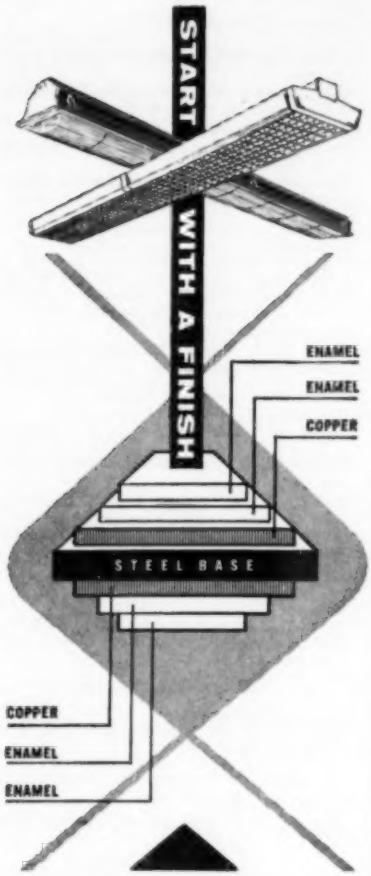


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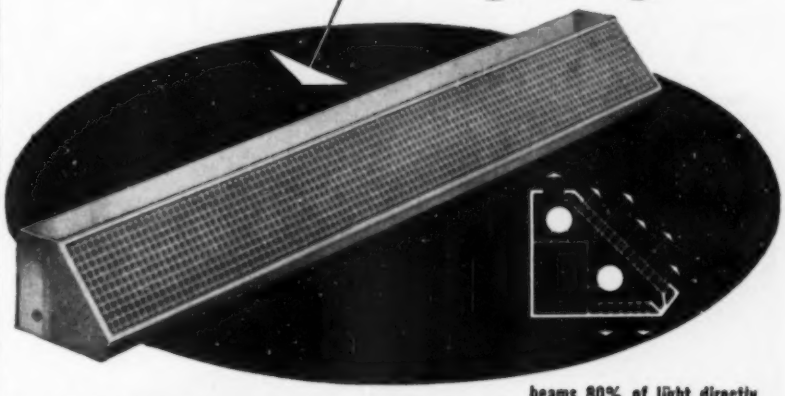

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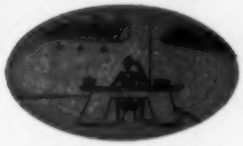
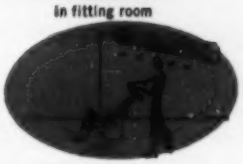
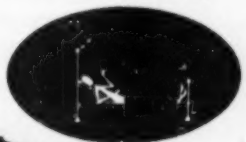


as luminous indirect cove

in fitting room



in barber shops



over hospital bed

chalkboard downlite with cove

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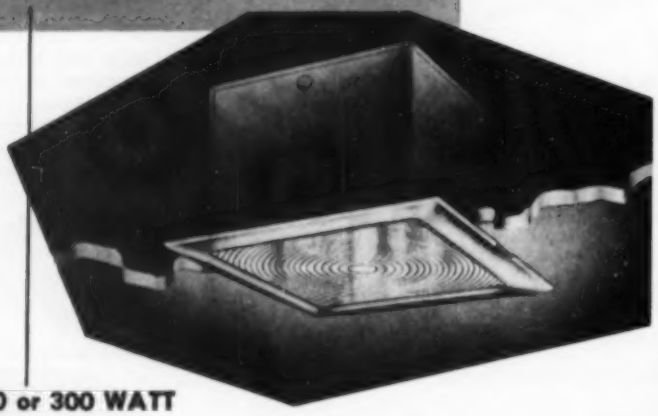

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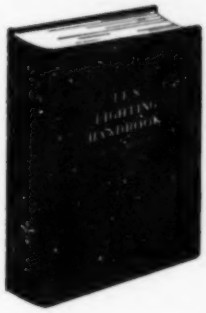

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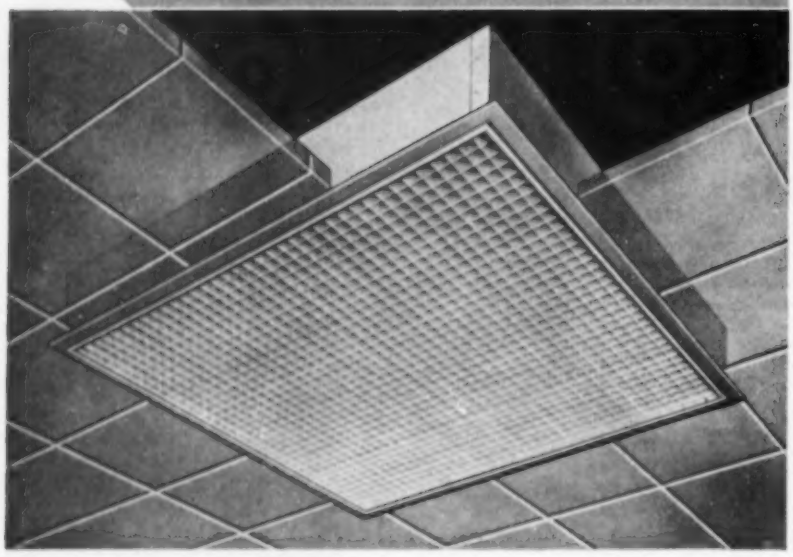

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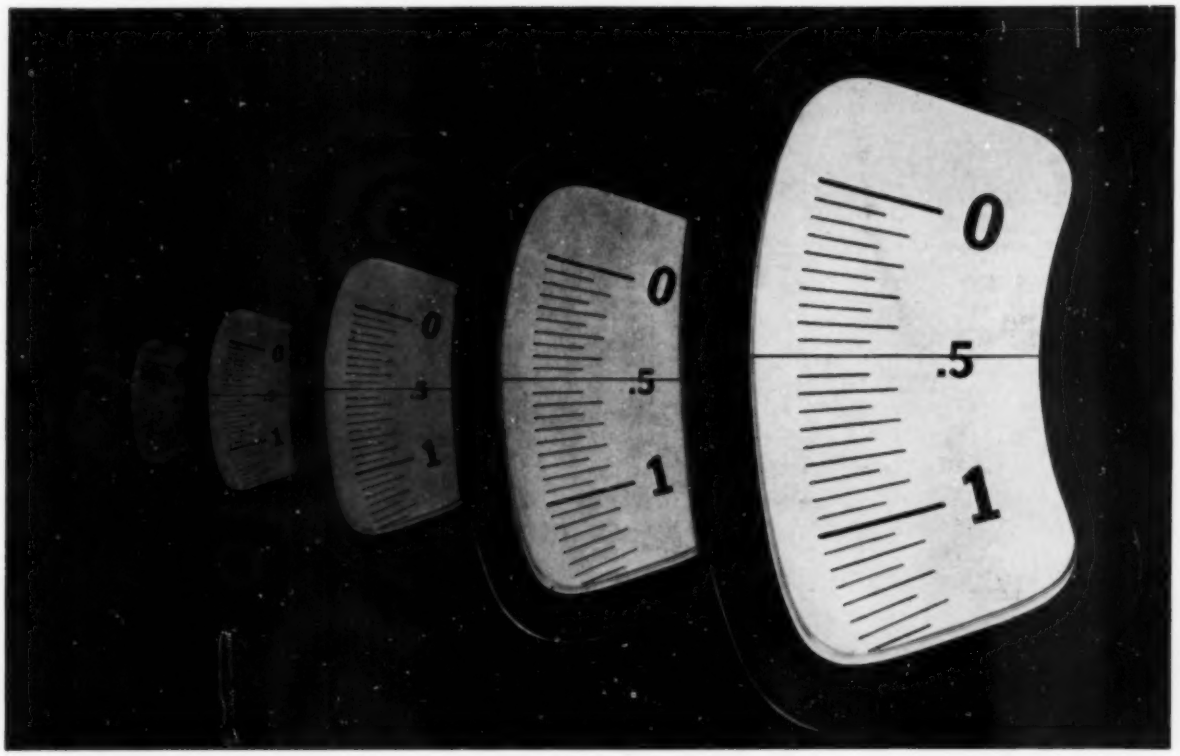


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